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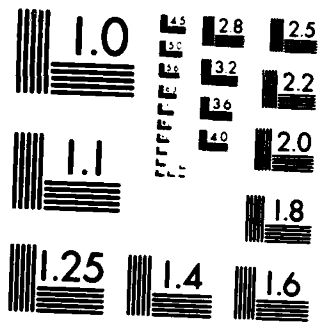

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Long Island Sound
Dredged Material Containment
Feasibility Study

AD A 122 620

Social & Economic Impacts Of Selected Potential Dredged Material Containment Facilities In Long Island Sound

US Army Corps
of Engineers
New England Division

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The study discusses the analysis of social and economic impacts associated with the construction of prototype dredged material containment facilities at six portential locations along the Connecticut shoreline in Long Island Sound. The analysisincludes determination of the economic efficiency of each of the six prototype containment facilities (Morris Cove in New Haven Harbor, Fayerweather Island in Black Rock Harbor, Yellow Mill Channel in Bridgeport Harbor, Clinton Harbor, Twatree Island of Waterford, and Black Ledge at the mouth of New London Harbor), and comparison with alternative disposal methods.

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SOCIAL AND ECONOMIC IMPACTS OF PROTOTYPE
DREDGED MATERIAL CONTAINMENT FACILITIES
IN LONG ISLAND SOUND

CEM Report No. 4280-08-735

The Center for the **ENVIRONMENT & MAN,** Inc.

275 Windsor Street   Hartford, Connecticut 06120

Report to

Department of the Army
New England Division
CORPS OF ENGINEERS

on

Contract No. DACW33-80-C-0118
Work Order No. 8
(Mrs. Diana Halas, Contract Monitor)

SOCIAL AND ECONOMIC IMPACTS OF PROTOTYPE DREDGED MATERIAL CONTAINMENT FACILITIES IN LONG ISLAND SOUND

CEM Report No. 4280-08-735

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September 1981

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In this report, the term "Cultural Resources" refers to schools, universities, museums, theatres, aquariums and research facilities. It also includes historic properties already listed on the National Register of Historic Places. However, it does not include consideration of historic and prehistoric properties that may or may not be known presently. This would include Indian and historic sites with few visible surface remains and underwater sites (i.e. shipwrecks and submerged Indian sites). These latter "Cultural Resources" are being studied by in-house staff at the Corps of Engineers, and will be included in the final study report.

Appendix F "Cultural Resources Inventory Data" has been removed pending completion of the prehistoric and historic archaeological report.

ERRATA

Page 4-18: TABLE 4-6, Table Heading, "Objection" should be "Objection/Special Condition".

Page 6-11: "The need for a park in such a high density area....." should read, "A park in such a high density area.....".

ACKNOWLEDGEMENTS

The primary input to this study was the attitudes, data, and comments provided by those agency officials and staff, opinion leaders, and others who participated in the attitude survey. While they are far too many to single out by name, to all we offer our sincere appreciation. Ms. Diana Halas, Dr. Steve Rubin and Mr. Richard Quinn of the New England Division of the Corps of Engineers established the requirements for this study and provided guidance throughout, and to them we also express our thanks.

A considerable amount of ground was covered in this study. Numerous assumptions and tentative scenarios of the future were necessary for discussing events which only may possibly occur in the future. The authors recognize that others may wish to dispute these speculations and we encourage them to do so--we claim no monopoly on our ability to project what will actually occur in the future. One thing we are relatively certain of is that there will continue to be a need to dredge and dispose of sand and other sediments from the harbors, ports, and estuaries of Long Island Sound. The prototype dredged material containment facilities discussed herein appear to offer viable opportunities for meeting at least some of these needs.

The authors hope that this report will provide some initial insight into the potential adverse and beneficial social and economic impacts that could stem from the use of dredged material containment facilities as an alternative disposal method. While willingly acknowledging the many contributions of others to this report, the authors are equally willing to take responsibility for all assumptions and results contained herein.

EXECUTIVE SUMMARY

This study was performed by The Center for the Environment and Man, Inc. (CEM) in partial fulfillment of Work Order No. 8, under Contract No. DACW33-80-C-0118 in support of the New England Division of the Corps of Engineers (NED/CE).

The objective of Work Order No. 8 was to analyze social and economic impacts associated with the construction of prototype dredged material containment facilities at six potential locations along the Connecticut shoreline in Long Island Sound: Fayerweather Island in Black Rock Harbor, Yellow Mill Channel in Bridgeport Harbor, Morris Cove in New Haven Harbor, Clinton Harbor, Twotree Island off Waterford, and Black Ledge at the mouth of New London Harbor. Short-term impacts during construction of dikes, filling with dredged material, dewatering, and final capping, contouring and planting have been examined, as well as long-term impacts involving final use.

The analysis includes determination of the economic efficiency of each of the six prototype containment facilities and comparison with alternative disposal methods which were specified by NED/CE: (1) land disposal, (2) disposal in Long Island Sound, and (3) disposal in the open ocean. Subtasks accomplished include:

- Research of existing literature on containment facilities.
- Preparation of an overview of the Long Island Sound region.
- Determination of potential uses for each facility.
- Determination of primary and secondary short-term and long-term social and economic impacts.
- CEM staff attendance at four NED/CE public workshops, held at New London, New Haven, Stamford, and Great Neck, during 18-21 May 1981.
- Determination of social acceptability of containment facilities in Long Island Sound.
- Economic analysis of the cost efficiency of each proposed containment facility including:
  1. Examination of the most efficient service area for each facility.
  2. Comparison of proposed capacities and dredging needs in the immediate area.
  3. Comparison of the cost/cu yd of dredged material disposal by containment facility, land disposal (1 mi), Long Island Sound disposal (10 mi), and open ocean disposal (100 mi).
  4. Possible economic return through use of land created by containment facilities or alternative disposal methods.

Limitations of this Analysis

Dredged material containment facilities have been initiated at more than two hundred sites throughout the U.S. Some have been completed and are now incurring final use. In general, the Corps of Engineers follows three sequential planning stages in the development of new dredged material disposal areas. Stage 1 (Reconnaissance) identifies pertinent issues and solutions. Stage 2 (Intermediate Plans) is a screening process which singles out feasible options. Stage 3 (Detailed Plans) focuses on the viable alternative and includes: (1) detailed plans, (2) identification of potential management objectives, (3) identification of potentially significant impacts and (4) determination of the merits of continuing the program.

This is a Stage 2 report. While six potential dredged material containment facilities are considered herein, the reader should bear in mind that some may be dropped (and others might be added) in the course of the screening process. The social and economic impacts discussed herein are only preliminary. The figures given for dike lengths, volumes heights, etc., were specified by NED/CE and are believed to be maximums. It is likely that sites which may have significant adverse impacts that cannot be ameliorated by a reasonable change in engineering design or procedure will not survive the screening process. It should be clearly understood that a project which survives the Stage 2 screening process is likely to require an extensive period of time--possibly six to eight years--before construction of the dikes of a containment facility would begin. This would be a period of detailed planning and analysis, and extensive public hearings and participation.

This report, then, must be viewed in its proper light: It is meant to highlight potential social and economic impacts, to provide insight as to how the impacts can be eliminated or ameliorated, and to serve as one part of an overall screening procedure To view or interpret this report as anything other than initial findings and views would be to take it out of its intended context.

Long Island Sound Overview

The Long Island Sound region is considered to consist of Connecticut, with its four coastal and four inland counties, and the New York City region, with the five counties that are the boroughs of New York City, Nassau and Suffolk Counties which cover most of Long Island and Westchester County, which links New York City with southwestern Connecticut. This 16-county region has a population of nearly 13.7 million and an average population density of 2000 people/sq mi. During the Seventies, the eight-county New York City region lost 802,000 people. In New York City, the Borough of Staten Island (Richmond Co.) gained 57,000 people, while the other four boroughs (i.e., counties) lost nearly 882,000. On Long Island, Nassau County lost 107,000 and Suffolk gained 157,000. Population in Westchester County dropped by nearly 28,000. In this 10-year period, Connecticut gained 75,000 people, a modest increase of 2.5 percent, as compared to 26 percent growth in the Fifties and 20 percent in the Sixties.

While the U.S. grew in population by 11.5 percent in the Seventies, in the nine-state Northeast the rise was only 0.28 percent. Population in the Long Island Sound region dropped 3.1 percent, with modest growth in Connecticut and Suffolk County overwhelmed by large population losses in other counties in the New York City region. In contrast to the population loss, both housing and population grew in the LIS region: Connecticut added 177,000 dwelling units (18 percent), and the New York City region had an increase of 167,000 housing units (9 percent), with over two-thirds of the

growth occurring in Nassau and Suffolk Counties, where 120,000 net housing units were added.

In contrast to the population trends in the LIS region, nonagricultural employment grew 19 percent in Connecticut and dropped only 4.4 percent in the New York City region. Manufacturing employment in Connecticut was 422,000 in 1970 and dipped and climbed during the period, ending at the 1970 level. In New York City, manufacturing dropped steadily, losing 217,000 (-35 percent). In Nassau-Suffolk Counties, it grew by 14,000 and in Westchester County it remained essentially constant. Construction employment fell in both Connecticut and the New York City region. Transportation, Communication and Utilities grew modestly in Connecticut, but declined in the LIS region. In Wholesale and Retail Trade, Connecticut's 74,000 growth in jobs was essentially cancelled regionally by the 68,000 job loss in the New York City region. The Finance, Insurance and Real Estate sector saw a loss of 11,000 jobs in the New York City region and a growth of 31,000 jobs in Connecticut, leaving a net increase of 20,000 jobs in the LIS region. Services was the only major employment sector in the New York City region to show significant growth in the Seventies--18,000 jobs added (20 percent). In comparison, employment in the Connecticut Services sector rose dramatically to 102,000 (55 percent). Employment in the Government sector (federal, state, local) grew by 25,000 in Connecticut (16 percent) and remained essentially constant in the New York City region, even though population and overall employment declined significantly.

Overall, the LIS region had a 2.6 percent growth in nonagricultural employment and a drop of 3.1 percent in population. Estimates of population in 2035, at an extreme, range from 12.6 to 17.4 million, with a more probable range of 14.3 to 16 million--which represents small growth relative to the 1980 level of 13.7 million. Three population growth scenarios--ranging from pessimistic to modestly optimistic--have been investigated, with results for the fifty-year period of 1985-2035 shown in Figure 1. What growth pattern the region may follow in the future cannot be stated with any degree of certainty at this time. Even under the most pessimistic realistic scenario, it appears unlikely that the 16-county region around Long Island Sound will have a lower net population in 2035 than it does today. Conversely, even under relatively optimistic growth conditions, it does not appear that the region is likely to grow more than an average of 3 percent per decade, which would lead to a regional population of about 15.5 million in 2035, or an overall increase of about 14 percent--a growth consistently much less than the remainder of the nation during the foreseeable future. The availability and cost of energy in the Northeast, relative to the rest of the U.S., is considered to be the prime determinant of future growth in the LIS region.

Review of Dredging Permits in Connecticut to Provide Guidance for Scenarios and Impact Analysis

To provide background for this study, CEM analyzed the 49 permits issued by NED/CE for dredging/disposal projects in Connecticut in 1979 and 1980, which were 26 percent of the 187 permits of all types issued during that period. Dredging/disposal permits were issued for 23 locations, out of a total of 58 locations where NED/CE permitted all types of construction activities.

While 124 (nearly two-thirds) of all permit applications received 246 formal objections from the general public and agencies (or nearly two for every application objected to), only 20 of the 49 dredging/disposal applications received 30 objections (or an average of only 1.5 for the applications receiving objections). Nine objections (30 percent of the total) were lodged against just two applications, one of which received five from agencies, and the other one received four from the general public. Three applications

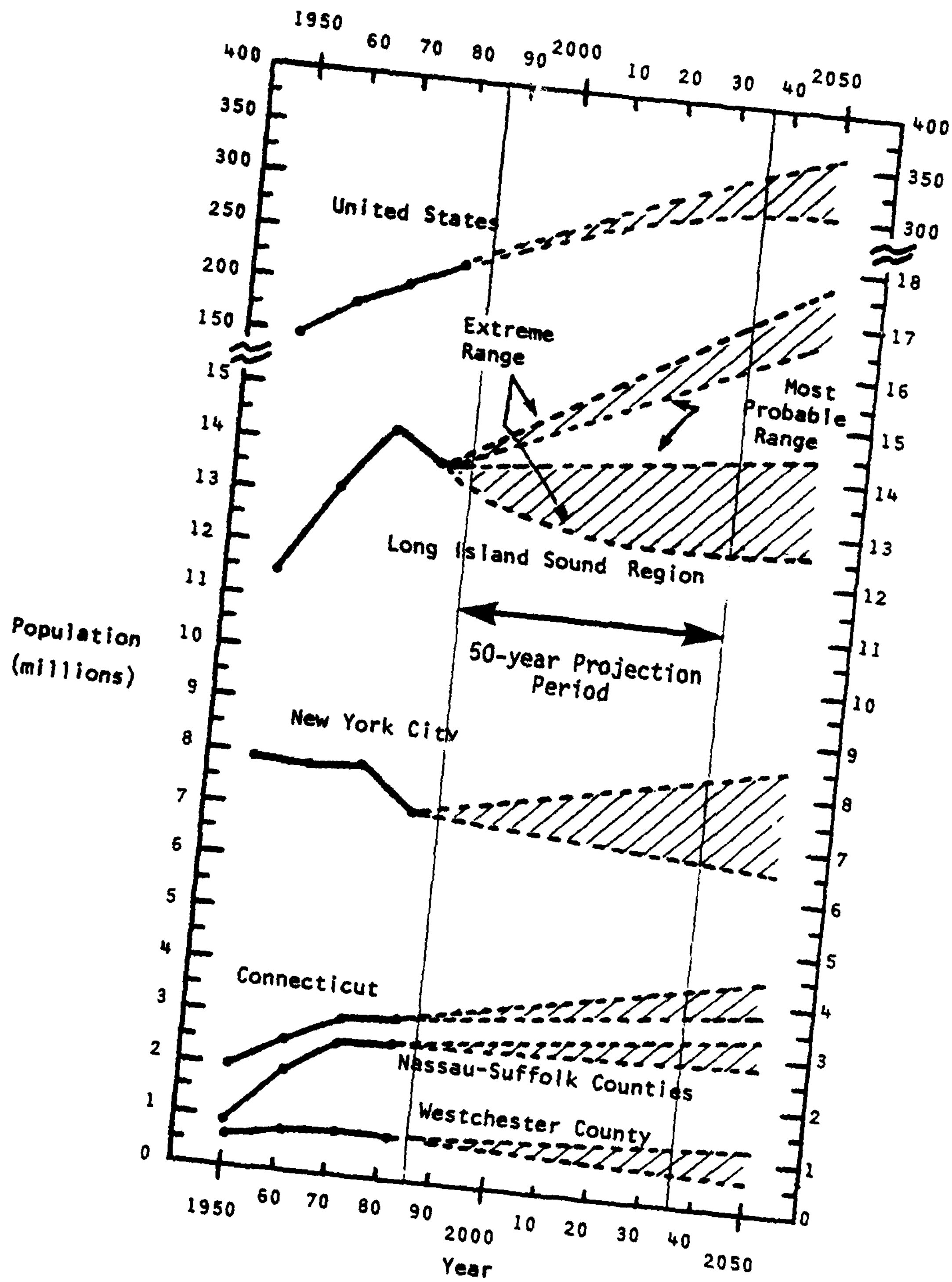

Figure 1. Population growth and possible projections: 1950-2050.

each received two objections. The remaining 15 received only one objection each. In total there were 16 objections from the general public, and 14 from federal, state or local agencies. Only in one case did an agency and the general public jointly object to an application. In all other instances, the objection(s) were either from the public or agencies.

Of the 14 agency objections, eight pertained to dredging of intertidal marsh or disposal on tidal wetlands. Other objections included dredging during June through September; depth of dredging; possible salinity change; need for a long-range plan for the entire river basin; and need for a full environmental impact statement. The permits issued by NED/CE were responsive to all but the last three objections.

The 16 general public objections included six concerned with open water disposal, and others related to: noise and water pollution; possible runoff and odor; adverse environmental and aesthetic impacts; and runoff that would encroach on a neighbor's land. These were all responded to in the issued permit. Public objections not receiving a response were: a 10-year permit for maintenance dredging is too long, and dredging will cause siltation of the basin.

Nine of the 49 permits included dredging/disposal mitigating measures, meaning the applicant submitted a revised form. Six of these were in response to formal objections, while it can only be surmised that the other three were probably modified in response to informal "suggestions." All but two of the 49 permits included special conditions imposed by NED/CE; twenty of the applications had received formal objections, but 27 had not, yet they had special conditions imposed by NED/CE because of the nature of the proposed dredging/disposal.

In brief, it is clear that dredging/disposal permit applications are probably better prepared than all applications in general, and that NED/CE is concerned about both responding to objections and to ensuring that all dredging/disposal projects are conducted in an acceptable manner. Also, it appears that the principal concerns of both reviewing agencies and the general public is protection of intertidal marshes from dredging and objection to open water disposal in LIS. This suggests that the proposed dredged material containment facilities may be responsive to a perceived regional need, which is well-defined by this analysis of dredging permits.

Site Scenarios and Summaries

Six potential prototype dredged material containment facility sites along the Connecticut shore have been specified by the New England Division of the Corps of Engineers. They are listed in Table 1, along with some proposed salient characteristics.

TABLE 1

PROPOSED CHARACTERISTICS OF SIX POTENTIAL PROTOTYPE DREDGED MATERIAL CONTAINMENT FACILITIES IN LONG ISLAND SOUND

Site Name	Harbor	Capacity (10^6 cu yd)	Area (acres)	Dike Height Above Mean Low Water (ft)	Total Dike Length (ft)
1. Fayerweather Island	Black Rock	1.4	52	15	3,800
2. Yellow Mill Channel	Bridgeport	0.5	16.5	15	500
3. Morris Cove	New Haven	0.9	33.0	0	None
4. Clinton Harbor	Clinton	0.31	24.0	9	4,400
5. Twotree Island	Waterford	3.4	80.0	20	7,700 +1,500
6. Black Ledge	New London	11.0	190.0	20	12,000 +4,400

In the following, tentative scenarios for the six sites are presented, along with brief discussions of impacts and cost comparisons of dredging/disposal alternatives.

Scenario and Summary for Fayerweather Island/Black Rock Harbor

The 1.4 million cu yd containment facility at Fayerweather Island will be created by a 3800 ft long dike having an elevation of 15 ft above Mean Low Water, along the southeastern shore of Black Rock Harbor. The dike will be faced with one foot of riprap on a 1:1 slope. The 52-acre facility would essentially make the Fayerweather Island peninsula approximately 1000 ft wide throughout most of its length, similar to its present landward end. The planned final use of the site is passive recreation and the area would be a refuge for birds and other coastal animals. Its final appearance will be very similar to existing vegetated areas. The most significant adverse impact will be the elimination of an active shellfishing area.

There will be no dike construction, dredging or material placement during the months of June, July, August and September; and no night work is anticipated at any time. The dike would be constructed in March, April and May of the first year; filling could begin in the Fall of the first year and would continue for two or more years. The dike will require 70,000 cu yd of material transported by truck from inland borrow pits.

The unit cost of disposal at the Fayerweather Island prototype dredged material containment facility is $3.26/cu yd, which is less than either disposal in Long Island Sound ($4.20/cu yd) or open ocean disposal ($6.60/cu yd). However, land disposal is the most economical disposal method at $2.00/cu yd, **if** it is assumed that land for fill is available at no cost within one mile of all dredging, no dikes or water treatment are required, and hydraulic dredging is carried out with transport of the dredged material by temporary pipeline to the disposal site. The unit cost for containment facility disposal is dependent on the assumption of all fill material coming from local hydraulic dredging with temporary pipeline transport for distances up to three miles, thus including all of Bridgeport Harbor. The unit cost is also affected by the cost of dike construction and the assumption of a 1:1 slope (sheltered dike) and surfacing with one foot of riprap on both sides

Scenario and Summary for Yellow Mill Channel/Bridgeport

The one-half million cu yd containment facility in the upper 1400 ft of Yellow Mill Channel will be created by a 500-ft long dike having an elevation of 25 ft. The dike will be faced with one foot of riprap on a 1:1 slope. The 16.5 acre facility would have an expected final use as recreation fields for use by the inhabitants of the densely populated surrounding area. Federal assistance likely would be required to provide adequate funds for the equipping of the recreation area. Filling the upper portion of Yellow Mill Channel would eliminate a rat habitat and remove the continued risk of occasional drownings. The concept of filling the upper end of Yellow Mill Channel and making the area available for recreation has strong support from Bridgeport agencies. The most adverse potential impact is the possibility of interfering with barge access to D'Addario Sand and Gravel and the Jacobs Brothers' metal company. An effort will be made to mitigate these effects through suitable dike location and construction.

There will be no dike construction, dredging or material placement during the months of June, July August and September; and no night work is anticipated at any time. The dike would be constructed in March, April and May of the first year; filling could begin in the Fall of the first year and could continue for two or more years. The dike will require only 16,000 cu yd of impervious material transported by truck from inland borrow pits.

The unit cost of disposal at the Yellow Mill Channel prototype dredged material containment facility is $3.45/cu yd, which is less than either disposal in Long Island Sound ($4.20/cu yd) or open ocean disposal ($6.60/cu yd). However, land disposal is the most economical disposal method at $2.00/cu yd, if it is assumed that land for fill is available at no cost within 1 mile of all dredging, no dikes or water treatment are required, and hydraulic dredging is carried out with transport of the dredged material by temporary pipeline to the disposal site. The unit cost for containment facility disposal is dependent on the assumption of all fill material coming from Bridgeport Harbor with only hydraulic dredging occurring and temporary pipeline transportation of dredged material. The unit cost is also affected by the need to extend several storm drains that now empty into the upper reaches of Yellow Mill Channel.

Scenario and Summary for Morris Cove/New Haven Harbor

The 0.9 million cu yd containment facility at Morris Cove in southeastern New Haven Harbor results from filling a borrow pit having approximate dimensions of 2400 x 600 x 25 ft and capping with clean material. The 33-acre site would probably be suitable as a shellfish area. The most significant adverse impact will be the disturbance of shellfish adjacent to the site during placement of material.

There will be no dike construction. Dredging or material placement will not occur during the months of June, July, August and September; and no night work is anticipated at any time. Filling the borrow pit would occur in the Spring and Fall and would continue for about two years. The site could be filled entirely by New Haven Harbor material either from hydraulic or clamshell dredging or a combination of the two.

The unit cost of disposal at the Morris Cove dredged material containment facility is $1.72/cu yd with hydraulic dredging and the unit cost for landfill is $1.78/cu yd. Disposal in the Morris Cove containment facility and land disposal are the most economical disposal methods. It is assumed that land for upland disposal is available at no cost within one mile of all dredging, no dikes or water treatment are required, and hydraulic dredging is carried out with transport of the dredged material by temporary pipeline to the disposal site. These costs are less than either disposal in Long Island Sound ($4.20/cu yd) or open ocean disposal ($6.60/cu yd). The unit cost for containment facility disposal is dependent on the assumption that all fill material comes from local dredging. If clamshell dredging with transport by barge is carried out, the unit cost at the Morris Cove containment facility increases to $3.02/cu yd, which is still less than disposal in LIS or the open ocean. In general, the concept of using existing nearshore borrow pits for dredged material disposal appears to offer significant dredged material disposal opportunities that are both low in adverse impact and high in economic savings.

Scenario and Summary for Clinton Harbor

Cost estimates have been performed for two sizes of containment facilities in Clinton Harbor but an impact assessment has been carried out only for the smaller facility because a public attitude survey indicated strong resistance to a facility larger than that needed for Clinton Harbor. Further discussion pertains to the smaller facility only.

The 0.31 million cu yd containment facility at Clinton Harbor will be created by a 4400 ft long dike along the western shore of Clinton Harbor having an elevation of only 9 ft above Mean Low Water. The dike will be faced with two feet of riprap on a gentle

slope. The planned final use of the site is for creation of a marsh similar to present marshes found extensively in the area. Particular attention will be paid to proper marsh drainage to minimize insect problems. This project would add only a few percent to the existing marsh areas and would in fact partially compensate for lost marshland that has been filled in the past. The most significant adverse impact may be on existing shellfish. A biological survey now underway will establish the potential level of impacts.

There will be no dike construction, dredging or material placement during the months of June, July, August and September; and no night work is anticipated at any time. The dike would be constructed during Spring and Fall of the first year; filling could begin in the Spring of the second year and woiuld continue intermittently for about 25 years. The dike will require 75,000 cu yd of material dredged hydraulically and transported by temporary floating pipeline.

The unit cost of disposal at the Clinton Harbor prototype dredged material containment facility is $3.69/cu yd, which is less than either disposal in Long Island Sound ($4.20/cu yd) or open ocean disposal ($6.60/cu yd). However, land disposal is the most economical disposal method at $2.31/cu yd, if it is assumed that land for fill is available at no cost within one mile of all dredging, no dikes or water treatment are required, and hydraulic dredging is carried out with transport of the dredged material by temporary pipeline to the disposal site. The unit cost for containment facility disposal is dependent on the assumption of all fill material coming from local hydraulic dredging with temporary pipeline transport for distances up to one mile to include all of Clinton Harbor. The unit cost is also affected by the assumption that the dike is constructed of hydaulically-pumped material and the only construction cost is essentially the surface placement of two feet of riprap.

Scenario and Summary for Twotree Island/Waterford

The 3.4 million cu yd island containment facility three-quarters of a mile off the Waterford coastline will be created by a 7700 ft long dike rising 20 ft above an average depth of 20 ft at Mean Low Water. The exposed surface will be faced with four feet of riprap on a 2:1 slope. The 80-acre facility would be built around an existing ledge that barely rises above the water surface and may be considered a hazard to boating and ships. The facility would be divided into two cells by a 1500-ft interior dike of 1:1 slope surfaced by one foot of riprap. The planned final use of the site is for passive recreation and the area would be a refuge for birds and other coastal animals. This site is being given consideration at the suggestion of local conservationists. The most significant adverse impact would be the elimination of a scallop fishing area. The man-made island will ultimately appear similar to, but larger than, Pine Island and Bushy Point island, off Avery Point.

Dike construction will take place during a nine-month period from March through November. No night work is anticipated at any time The dike will require about 810,000 cu yd of material transported by truck from inland borrow pits to New London Harbor and thence by barge to the containment facility site location. An alternative might be to use rail cars to haul dike material to New London Harbor. Dredged material, extracted by clamshell, could be barged to the facility from seven harbors and river mouths within 30 miles. Placing 3.4 million cu yd of dredged material in the Twotree Island containment facility is expected to take up to 30 years.

The unit cost of disposal at the Twotree Island prototype dredged material containment facility is $11.28/cu yd, which is much greater than either disposal in Long Island Sound ($4.20/cu yd) or open ocean disposal ($6.60/cu yd). Land disposal is the most economical disposal method at $2.00/cu yd, if it is assumed that land for fill is available at no cost within one mile of all dredging, no dikes or water treatment are required, and hydraulic dredging is carried out with transport of the dredged material by temporary pipeline to the disposal site. The unit cost for containment facility disposal is dominated by construction costs that account for 58 percent of the total cost. Significant increases or decreases in the cost of construction of the dike would greatly alter the resultant unit cost.

Scenario and Summary for Black Ledge/New London Harbor

The 11.0 million cu yd island containment facility within 2000 feet of Avery Point will be created by a 12,000 ft long dike rising 20 ft above an average depth of 22 ft at Mean Low Water. The exposed surface of the dike will be faced with four feet of riprap on a 2:1 slope. The 190-acre facility would be built around a submerged ledge that presents a navigation hazard to large vessels. The facility would be divided into three cells by 2700 ft of interior dikes with a 1:1 slope and one foot of riprap. The final use of the site is for passive recreation and the area would be a refuge for birds and other coastal animals. The location of the site was suggested by local conservationists. A number of adverse impacts may occur. These include (1) traffic congestion during the dike construction period if material is hauled by truck from inland borrow pits; (2) effects on boating and large vessels because of heavy barge traffic bringing material to the facility; (3) displacement of shellfishing grounds; and (4) alteration of panoramic view. The facility in final form would appear similar to, but much larger than, nearby Pine Island and Bushy Point island.

Dike construction will occur during the nine-month period of March through November. The dike will require 1.2 million cu yd of material transported by truck from inland borrow pits.

The unit cost of disposal at the Black Ledge dredged material containment facility is $8.22/cu yd, which is considerably more than disposal in Long Island Sound ($4.20/cu yd) but only 25 percent more than open water disposal ($6.60/cu yd). Land disposal is the most economical disposal method at $1.66/cu yd, if it is assumed that land for fill is available at no cost within one mile of all dredging, no dikes or water treatment are required, and hydraulic dredging is carried out with transport of the dredged material by temporary pipeline to the disposal site. The unit cost for containment facility disposal is dependent on the assumption of all fill material coming from clamshell dredging at seven harbors and river mouths within 30 miles and barge transportation of the dredged material. The unit cost is also strongly affected by the cost of dike construction which accounts for 42 percent of the total cost. Significant increases or decreases in the cost of construction would greatly alter the unit cost.

Summary of "Most Significant" Impacts

Potential social, economic and environmental impacts have been assessed. An iterative process was followed in which preliminary scenarios for facilities were developed in coordination with NED/CE. These were used as a basis for discussion in personal and telephone interviews with concerned persons in the proposed site areas, to determine public attitudes. A preliminary assessment of potential impacts was made for 22 relevant attributes. Separate sets of potential impact assessments were made for short-term impacts covering the dike construction and dredged material placement, dewatering and surface shaping and planting, for both the primary impact area within one mile of the facility, and for the secondary impact area one mile to five miles around the site. Similar impact assessments were made for long-term impacts after completion of the facility, again for both primary and secondary impact areas. These preliminary potential impact results were communicated to NED/CE, followed by more detailed scenarios, revised to be responsive to results of the public attitude survey. The detailed scenarios were coordinated with NED/CE and used as a basis for a next round of more comprehensive assessment of potential impacts. The most significant of these impacts--both adverse and beneficial--are presented in highly summarized form in Table 2. (The summarized potential impacts in Table 2 include only the impacts judged "most significant." Many other potential impacts are presented in Sections 5 through 10 of the report, to which the reader is referred for a more thorough assessment.)

Summary of Cost Analyses

Cost analyses of the six prototype dredged material containment facilities and three alternative disposal methods were based on the following assumptions:

- Dredging at Fayerweather Island Yellow Mill Channel, Morris Cove, and Clinton Harbor would be done hydraulically, with pipeline transport. Because 12 to 16 inch pipeline transport limits operations to about two miles, these containment facilities would serve only the immediate harbor area. Dredging for Twotree Island and Black Ledge would be done by clamshell with barge transport from harbors up to 30 miles away.
- Land disposal cost is based on zero land acquisition cost, hydraulic dredging and pipeline transport of an average of one mile.
- Long Island Sound disposal implies clamshell dredging and transport by barge for an average distance of 10 miles.
- Open ocean disposal implies clamshell dredging and transport by barge for an average distance of 100 miles.
- Dredging cost at individual sites is \$1.50/cu yd for clamshell and \$1.00/cu yd for hydraulic dredging.
- Hydraulic transport of dredged material by temporary floating pipeline is \$250,000/mile of pipe. arge transportation of dredged material is estimated to be \$2.70/cu yd for 10 miles and \$5.10/cu yd at 100 miles, with linear variation in between.
- The installed cost of fill material for dikes is \$12.00/cu yd. Small riprap (one to two ft diameter) is \$25/cu yd; large riprap (about 4 ft diameter) is about \$120/cu yd.

TABLE 2

SUMMARY OF POTENTIAL IMPACTS JUDGED "MOST SIGNIFICANT"

PROPOSED SITE	SHORT-TERM IMPACTS		LONG-TERM IMPACTS	
	Impact Area *		Impact Area	
	Primary	Secondary	Primary	Secondary
1. Fayerweather Island	• Disrupt existing oyster bed.	• Boating and construction hazards.	• Loss of some boat mooring space. • Loss of oyster bed.	--
2. Yellow Mill Channel	• Large populace adjacent during construction. • Indian pottery grounds nearby.	--	• Potential loss of mooring facilities. • Would satisfy strong need for recreation area. • Would reduce rat habitat.	• Would satisfy need for additional recreational area.
3. Morris Cove	• Oyster bed on perimeter may be disturbed.	--	• Would likely expand oyster habitat.	• Possible additional income for oyster fishermen.
4. Clinton Harbor	• Increase in marsh insects possible. • Shellfish area may be disrupted.	--	• Must have proper drainage of created marsh. • New marsh replaces marshes filled in past.	• New marsh replaces marshes filled in past.
5. Twotree Island	• Boating and construction hazard. • Visual appearance.	• Visual appearance. • Transport of large amounts of dike material.	• Wildlife habitat increased. • Man-made island covers hazardous shoals. • May cause siltation of Millstone II intake.	• Passive recreational and educational benefit derived from wildlife habitat.
6. Black Ledge	• Boating and construction hazard. • Visual appearance.	• Visual appearance. • Transport of large amounts of dike material.	• Wildlife habitat increased. • Man-made island covers hazardous shoals. • Passive recreational and educational benefit derived from wildlife habitat. • Visual appearance.	• Passive recreational and educational benefit derived from wildlife habitat.

*Primary impact area is one-mile radius; secondary impact area is one to five-mile radius.

Under these assumptions, Table 3 compares the total costs of the six proposed prototype containment facilities. It also compares unit costs of the facilities and the three disposal alternatives. In all cases, the unit costs of land disposal is the most economical, primarily because of the zero-land-cost assumption; the lack of inclusion of costs for any dikes or water treatment that might be required; and the specification of hydraulic dredging with only one mile of pipeline transport. Small containment facilities with small (or no) dikes and local hydraulic dredging are more economical than LIS or open ocean disposal. The man-made island containment facilities (Twotree Island and Black Ledge) off Waterford and near the entrance to New London Harbor both have unit costs that exceed that of disposal in Long Island Sound or the open ocean. In both cases the principal cost components of the man-made islands are construction of the dike and transport of the dredged material by barge.

TABLE 3

COMPARISON OF PROPOSED PROTOTYPE DREDGED MATERIAL CONTAINMENT FACILITY COSTS AND COSTS OF ALTERNATIVES

Site for Containment Facility	Method of Dredging	Facility Capacity (10^6 cu yd)	Total Facility Costs ($ millions)	Comparative Unit Costs ($/cu yd)			
				Containment Facility	LIS Disposal (10 mi)	Open Ocean Disposal (100 mi)	Land Disposal* (1 mi)
1. Fayer-weather Island	Hydraulic	1.4	4.597	3.26	4.20	6.60	1.85
2. Yellow Mill Channel	Hydraulic	0.5	1.727	3.45	4.20	6.60	2.00
3. Morris Cove	Hydraulic	0.9	1.550	1.72	4.20	6.60	1.78
4. Clinton Harbor	Hydraulic	0.31	1.143	3.69	4.20	6.60	2.31
5. Twotree Island	Clamshell	3.4	38.459	11.28	4.20	6.60	2.01
6. Black Ledge	Clamshell	11.0	90.525	8.22	4.20	6.60	1.66

*Does not include costs for diking to achieve dewatering, nor cost of water treatment which might be required for Class II and III dredged materials.

Figure 2 shows the relationship of total project cost to capacity. For containment facilities that lead to an expansion of shore areas (Fayerweather Island, Yellow Mill Channel, and Clinton Harbor) and involve hydraulic dredging, total facility cost is approximately the product of capacity times a factor of about \$3 to \$4/cu yd. For the larger man-made island facilities, total facility cost is approximately the product of capacity times a factor of about \$8 to \$11/cu yd.

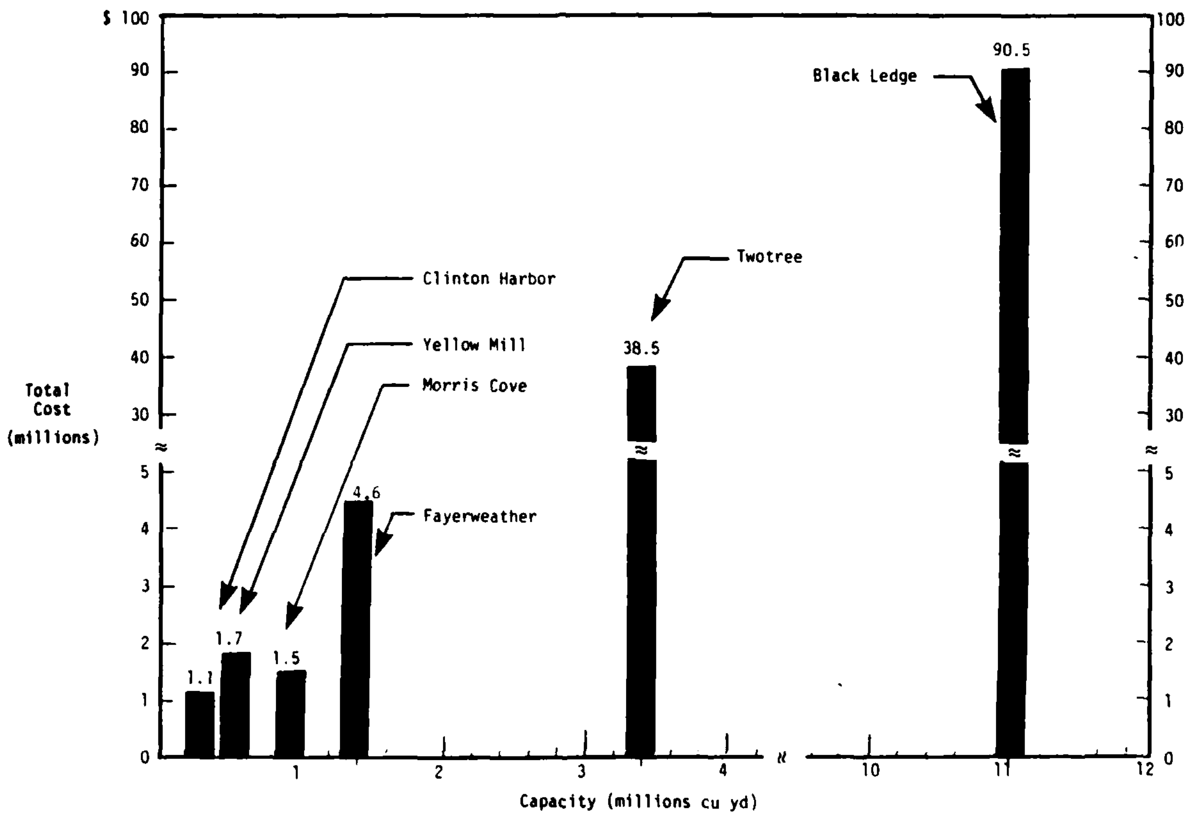

Figure 2. Total cost of prototype containment facilities as a function of capacity.

The unit costs of alternative disposal methods are compared graphically in Figure 3. It is evident that except for the Morris Cove case, where no dike costs are incurred, land disposal is the most economic alternative. Disposal in old borrow pits in the harbor area, as in Morris Cove, is the overall most economic method. Shoreside containment facilities are more economical than disposal in Long Island Sound or the open ocean. However, disposal in man-made islands is more costly than LIS or open ocean disposal.

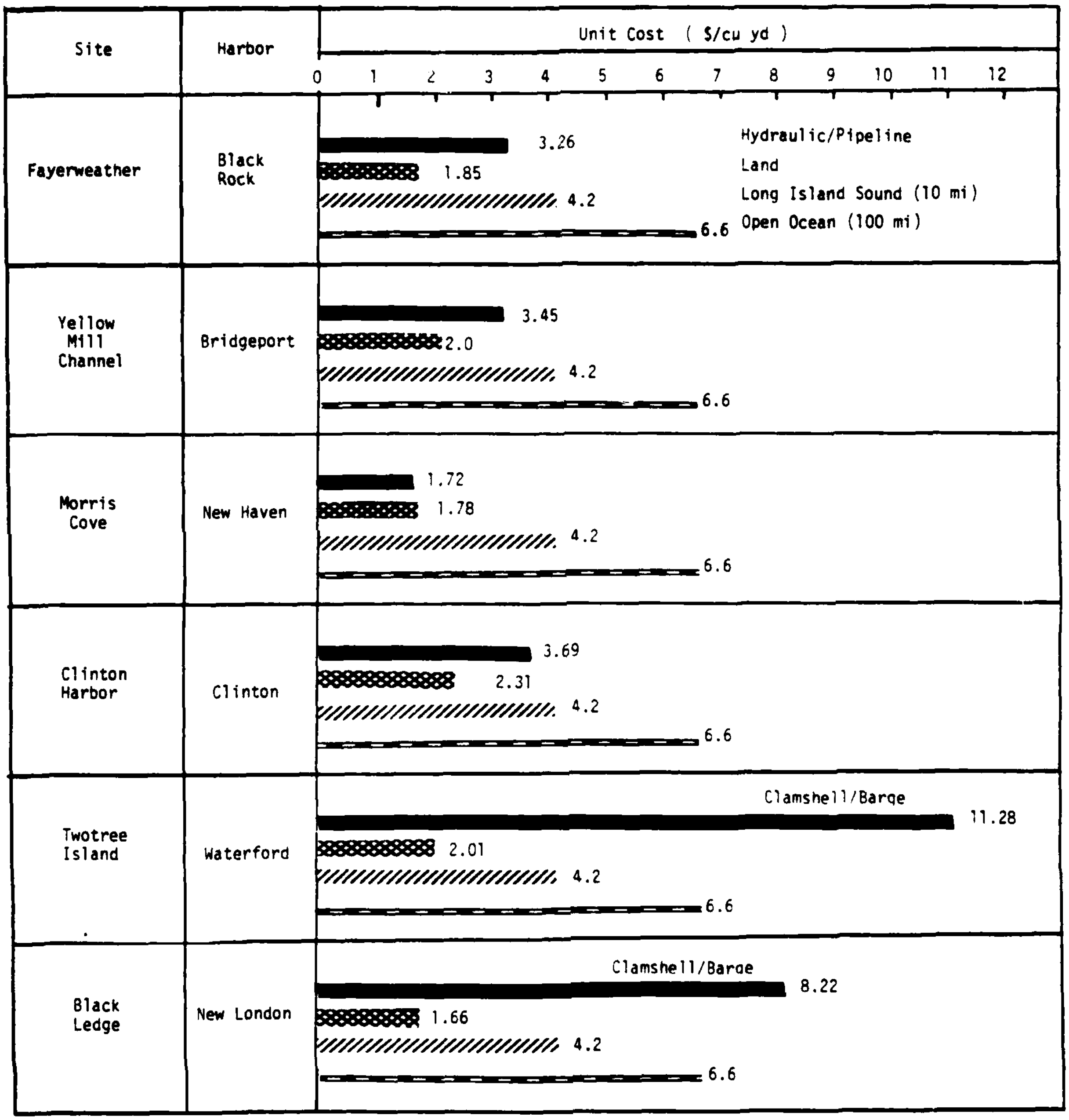

Figure 3. Comparison of unit costs of dredging and disposal of dredged material, by site and alternative disposal method.

Figure 4 shows cost breakdown for each facility as a percent of total cost, for dredging, transport, construction and disposal. With the exception of Morris Cove, dredging accounts for 13 to 32 percent of the cost; transport is 14 to 34 percent; construction ranges from 25 to 58 percent; and disposal is 4 to 17 percent. In all cases, the combination of dredging and construction comprises 52 to 72 percent of the cost--clearly the two dominant factors.

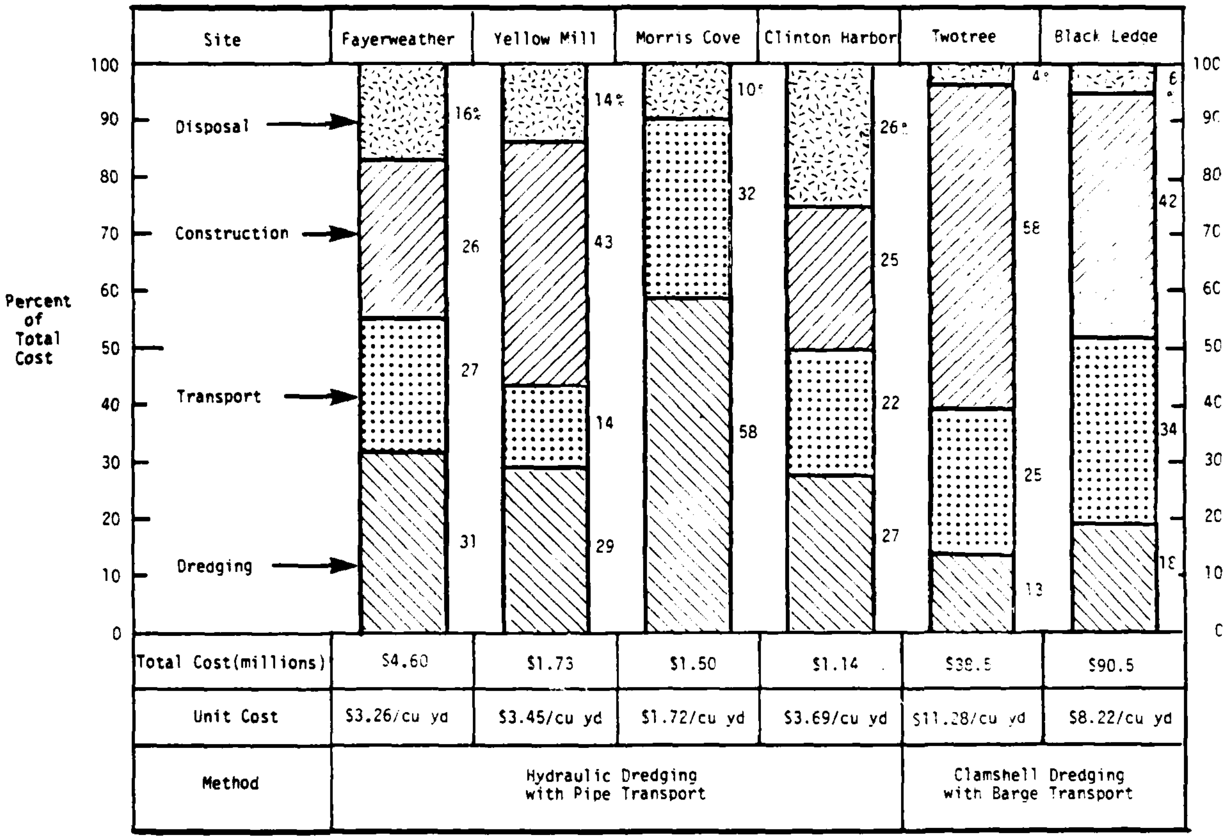

Figure 4. Comparison of cost components for six prototype dredged material containment facilities in Long Island Sound.

Overall Summary

The above impact and cost analyses clearly show:

- Of the proposed prototype dredged material disposal facilities, the use of an old borrow pit in Morris Cove, New Haven Harbor, has the lowest unit cost, equalling that of land disposal, but its 900,000 cu yd capacity will probably be filled in two or so years. It also has the least significant potential adverse social impacts.
- Yellow Mill Channel compares favorably with Fayerweather Island on a cost basis, in serving Bridgeport Harbor needs. Filling Yellow Mill Channel is a locally popular concept, and would have fewer adverse social impacts, because when completed it could provide additional recreational space in a densely populated urban area, whereas the Fayerweather Island facility would eliminate an area of active shellfishing. However, the Fayerweather Island facility would provide almost three times the capacity of Yellow Mill Channel. Disposal at either facility is more economic than open water disposal of dredged material from Bridgeport Harbor.
- The 24-acre Clinton Harbor containment facility would serve the harbor's dredging needs for 25 years, with little adverse social impact. Containment facility disposal would be more economic than open water disposal, while at the same time, it would replace local marsh area taken by filling in the past.
- The proposed Twotree Island and Black Ledge man-made island containment facilities would have unit costs higher than either Long Island Sound or open ocean disposal. They would be sizeable structures, each entailing several significant potentially adverse social impacts. On the positive side, construction of either would satisfy dredging disposal needs in northeastern Long Island Sound for 30 years or more, thus satisfying objections to the more economic open water disposal alternatives.
- Nearby land disposal is always the most economic method, if access to the land can be acquired at no cost; dikes and water treatment are not required; and dredging is done hydraulically. Public acceptance of land disposal may be difficult to obtain, even if land is available.

The reader should note that the social impacts and project costs discussed herein are highly tentative. The analyses presented in the main body of this report are intended to provide a basis for discussion between the New England Division/Corps of Engineers and the concerned public in the regions surrounding the proposed dredged material containment facilities. None of the proposed containment facilities will be implemented before the required preparation of detailed design, field investigations, and an environmental impact statement--along with concurrent public meetings--has been accomplished.

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Background

This report has been prepared by The Center for the Environment and Man, Inc. (CEM) in partial fulfillment of Work Order No. 8, under Contract No. DACW33-80-C-0118 in support of the New England Division of the Corps of Engineers (NED/CE).

1.2 Objectives

The objective of Work Order No. 8 was to analyze social and economic impacts associated with the construction of prototype dredged material containment facilities (DMCF) at six potential locations along the Connecticut shoreline in Long Island sound: Fayerweather Island in Black Rock Harbor, Yellow Mill Channel in Bridgeport Harbor, Morris Cove in New Haven Harbor, Clinton Harbor, Twotree Island off Waterford, and Black Ledge at the mouth of New London Harbor. Short term impacts during construction of dikes, filling with dredged material, dewatering, and final capping, contouring, and planting have been examined, as well as long term impacts involving final use.

The analysis includes determination of the economic efficiency of each of the six prototype DMCF's and comparison with alternative disposal methods which were specified by NED/CE: (1) land disposal; (2) disposal in Long Island Sound; and (3) disposal in the open ocean. Subtasks accomplished include:

- Research of existing literature on containment facilities.
- Determination of potential uses for each facility.
- Determination of primary and secondary short-term and long-term social and economic impacts.
- CEM staff attendance at four NED/CE public workshops, held at New London, New Haven, Stamford, and Great Neck, during 18-21 May, 1981.
- Determination of social acceptability of containment facilities in Long Island Sound.
- Economic analysis of the cost efficiency of each proposed containment facility including:
  1. Examination of the most efficient service area for each facility.
  2. Comparison of proposed capacities and dredging needs in the immediate area.
  3. Comparison of the cost/cu yd of dredged material disposal by containment facility, land disposal (1 mi), Long Island Sound disposal (10 mi), and open ocean disposal (100 mi).
  4. Possible economic return through use of land created by containment facilities or alternative disposal methods.
- Preparation of an overview of the Long Island Sound region.

1.3 Approach

The approach to achieving the objective of this work order began with the requisite review of the literature, cited in Appendix A. Preliminary configurations for the six containment facilities were postulated. Some of the SELECS methodology* developed by CEM for the U.S. Department of Energy was used to establish five impact categories and 22 attributes. Site visits were made by CEM staff and personal interviews were held with a wide spectrum of public officials private citizens with shoreline interests, and other community opinion leaders. Concurrently, preliminary costing of containment facility construction and alternative disposal methods was undertaken, and a review of 1970-1980 population and employment shifts in the Long Island Sound region was made, and trends projected. For background information, data on 193 general permits issued by NED/CE for projects in Connecticut in 1979 and 1980 were analyzed to determine the sources and nature of objections to recent dredging and non-dredging permit applications from Connecticut, and what steps were taken by applicants to ameliorate objections. The preliminary results of the interviews were summarized and a subjective summary of short and long-term primary (within one mile radius of the facility) and secondary (within one to five miles radius) impacts were prepared. More detailed scenarios were developed, describing the possible sequence and magnitude of events that might be involved in constructing and filling each facility All aspects of the study were then summarized in this report.

1.4 Limitations of this Analysis

Dredged material containment facilities have been initiated at more than two hundred sites throughout the U.S. Some have been completed and are now incurring final use.** In general, the Corps of Engineers follows three sequential planning stages in the development of new dredged material disposal areas. Stage 1 (Reconnaissance) identifies pertinent issues and solutions. Stage 2 (Intermediate Plans) is a screening process which singles out feasible options. Stage 3 (Detailed Plans) focuses on the viable alternatives, and includes: (1) detailed plans; (2) identification of potential management objectives; (3) identification of potentially significant impacts; and (4) determination of the merits of continuing the program.

This is a Stage 2 report. While six potential dredged material containment facilities are considered herein, the reader should bear in mind that some may be

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* SELECS = Site Evaluation for Energy Conversion Systems. (References 1, 2, 3)

** One completed demonstration project is a land disposal containment facility on the northern end of Nott Island, opposite Essex, in the Connecticut River, about six miles upstream from its mouth. The final use for the facility is animal habitat.

dropped (and others might be added) in the course of the screening process. The social and economic impacts discussed herein are only preliminary. It is likely that sites which may have significant adverse impacts that cannot be ameliorated by a reasonable change in engineering design or procedure will not survive the screening process. It should be clearly understood that a project which survives the Stage 2 screening process is likely to require an extensive period of time--possibly six to eight years--before construction of the dikes of a containment facility would begin. This would be a period of detailed planning and analysis, and extensive public hearings and participation. At Clinton and Bridgeport Harbors, biological sampling of benthic (bottom) life is presently underway, as part of the Stage 2 screening process. Core samples of the Clinton Harbor site will be obtained in 1981-1982, to determine foundation conditions.

This report, then, must be viewed in its proper light: It is meant to highlight potential social and economic impacts, to provide insight as to how the impacts can be eliminated or ameliorated, and to serve as one part of an overall screening procedure. To view or interpret this report as anything other than initial findings and views would be to take it out of its intended context.

1.5 Outline of the Report

Section 2 presents the findings and conclusions of this study. A brief overview of population and employment trends over the Seventies and possible future trend projections are given in Section 3. Results of the analysis of 1979-1980 NED/CE permits in Connecticut are given in Section 4. Sections 5 through 10 are self-contained "mini-reports" on each of the six potential dredged material containment facilities. They are intended to be suitable as background material to be made available to citizens in each of the site regions, prior to public hearings. To make these sections self-sufficient, a certain amount of explanatory material is repeated in each section. Details of the cost analyses are presented in Section 11. Appendix A contains the review of the bibliography, while Appendix B presents summaries of personal and telephone interviews. Appendix C provides background material for projections of population growth in the LIS region. The source material for the analysis of dredging permits is given in Appendix D. Appendix E provides a review of the four containment facility workshops conducted by NED/CE. Cultural resources inventory data are contained in Appendix F.

2.0 FINDINGS AND CONCLUSIONS

2.1 Background

Six potential prototype dredged material containment facility sites along the Connecticut shore have been specified by the New England Division of the Corps of Engineers. They are listed in Table 2-1, along with some proposed salient characteristics.

TABLE 2-1

PROPOSED CHARACTERISTICS OF SIX POTENTIAL PROTOTYPE DREDGED MATERIAL CONTAINMENT FACILITIES IN LONG ISLAND SOUND

Site Name	Harbor	Capacity (10^6 cu yd)	Area (acres)	Dike Height Above Mean Low Water (ft)	Total Dike Length (ft)
1. Fayerweather Island	Black Rock	1.4	52	15	3,800
2. Yellow Mill Channel	Bridgeport	0.5	16.5	15	500
3. Morris Cove	New Haven	0.9	33.0	0	None
4. Clinton Harbor	Clinton	0.31	24.0	9	4,400
5. Twotree Island	Waterford	3.4	80.0	20	7,700 +1,500
6. Black Ledge	New London	11.0	190.0	20	12,000 +4,400

To meet the objectives of this study, CEM:

- o Reviewed pertinent literature (see Appendix A).
- o Prepared an overview of population and employment trends in the Long Island Sound region (see Section 3 and Appendix C).
- o Analyzed in detail 49 dredging/disposal permits issued in 1979 and 1980 for Connecticut projects (see Section 4 and Appendix D).
- o Performed impact analyses and cost estimates for the six proposed prototype dredged material containment facilities (see Sections 5 through 11, and Appendices B and E).

2.2 Long Island Sound Overview

The Long Island Sound region is considered to consist of Connecticut, with its four coastal and four inland counties, and the New York City region, with the five counties that are the boroughs of New York City, Nassau and Suffolk Counties, which cover most of Long Island, and Westchester County, which links New York City with southwestern Connecticut. This 16-county region has a population of nearly 13.7 million and an average population density of 2000 people/sq mi. During the Seventies, the New York City region lost 802,000 people. In New York City, the Borough of Staten Island (Richmond Co.) gained 57,000 people, while the other four boroughs (i.e., counties) lost nearly 882,000. On Long Island, Nassau County lost 107,000 and Suffolk

unty gained 157,000. Population in Westchester County dropped by nearly 28,000. In this 10-year period, Connecticut gained 75,000 people, a modest increase of 2.5 percent, as compared to 26 percent growth in the Fifties and 20 percent in the Sixties.

While the U.S. grew in population by 11.5 percent in the Seventies, in the Northeast the rise was only 0.28 percent. Population in the Long Island Sound region dropped 3.1 percent, with modest growth in Connecticut and Suffolk County overwhelmed by large population losses in other counties in the New York City region. In contrast to the population loss, both housing and population grew in the LIS region: Connecticut added 177,000 dwelling units (18 percent), and the New York City region had an increase of 167,000 housing units (9 percent), with over two-thirds of the growth occurring in Nassau and Suffolk Counties, where 120,000 net housing units were added.

In contrast to the population trends in the LIS region, nonagricultural employment grew 19 percent in Connecticut and dropped only 4.4 percent in the New York City region. Manufacturing employment in Connecticut was 422,000 in 1970 and dipped and climbed during the period, ending at the 1970 level. In New York City, manufacturing employment dropped steadily losing 217,000 (-35 percent). In Nassau-Suffolk Counties, it grew by 14,000 and in Westchester County it remained essentially constant. Construction employment fell in both Connecticut and the New York City region. Transportation, Communications and Utilities grew modestly in Connecticut, but declined in the LIS region. In Wholesale and Retail Trade, Connecticut's 74,000 growth in jobs was essentially cancelled regionally by the 68,000 job loss in the New York City region. The Finance, Insurance and Real Estate sector saw a loss of 11,000 jobs in the New York City region and a growth of 31,000 jobs in Connecticut, leaving a net increase of 20,000 jobs in the LIS region. Services was the only major employment sector in the New York City region to show significant growth in the Seventies--18,000 jobs added (20 percent). In comparison, employment in the Connecticut Services sector rose dramatically to 102,000 (55 percent). Employment in the Government sector (federal, state, local) grew by 25,000 in Connecticut (16 percent) and remained essentially constant in the New York City region, even though population and overall employment declined significantly. Overall, the LIS region had a 2.6 percent growth in nonagricultural employment and a drop of 3.1 percent in population. Estimates of population in 2035 range at an extreme range from 12.6 to 17.4 million, with a more probable range of 14.3 to 16 million--which represents small growth relative to the 1980 level of 13.7 million. The availability and cost of energy in the Northeast relative to the rest of the U.S., is considered to be the prime determinant of future growth in the LIS region.

2.3 Review of Dredging Permits in Connecticut to Provide Guidance for Scenarios and Impact Analysis

To provide background for this study, CEM analyzed the 49 permits issued by NED/CE for dredging/disposal projects in Connecticut in 1979 and 1980. This represents 26 percent of the 187 Connecticut permits of all types issued during the period. Permits were issued for a total of 58 locations; however, dredging/disposal was permitted at the 23 locations (40 %), listed in Table 2-2 below along with the number of permits at each location.

TABLE 2-2

LOCATIONS OF 49 DREDGING/DISPOSAL PERMITS IN CONNECTICUT: 1979 AND 1980

1.	Clinton	......	6	13.	Branford	......	1
2.	Groton	......	6	14.	Chester	......	1
3.	E. Norwalk	......	4	15.	Essex	......	1
4.	Darien	......	4	16.	Greenwich	......	1
5.	Milford	......	4	17.	Haddam	......	1
6.	Norwalk	......	3	18.	New London	......	1
7.	Westbrook	......	3	19.	Noank	......	1
8.	New Haven	......	2	20.	Old Saybrook	......	1
9.	S. Norwalk	......	2	21.	West Haven	......	1
10.	Cos Cob	......	2	22.	Westport	......	1
11.	Rowayton	......	1	23.	Riverside	......	1
12.	Shelton	......	1		Total		49

The 49 dredging/disposal permits were 40 percent of the 123 total permits issued for projects at these 23 locations.

Of the 187 total Connecticut applications for permits which were granted in 1979 and 1980, 124 (66 %) received 246 objections from the general public and federal, state, and local agencies. However, of the 49 dredging/disposal applications for which permits were granted, only 20 (41 %) received 30 objections. Clearly, dredging applications had a lower objection rate than nondredging applications. This may have occurred because of more effort expended on the part of the dredging applicant to coordinate plans with all interested parties, prior to filing the permit application, due to the high visibility given to proposed dredging projects by the media, and the depth of concern about dredging and disposal shown by the cognizant public and agencies. Of the 20 permit applications receiving objections, twelve had objections only from the general public; seven received objections only from agencies; and one received objections from one member of the general public and one agency. Fourteen of the objections were from agencies--of these, five were directed to a single permit

application. Of the sixteen public objections, four were objections to a single application. Thus two permit applications accounted for 30 percent of the objections, and in these two cases, the objections stemmed entirely from either agencies or from the general public. Of the remaining applications, three each received two objections--two from two agencies and the other from one agency and one member of the general public. The remaining 15 applications received only one objection, either from an agency or a member of the general public. Summarizing, of the 49 permits issued, 29 received no objections to the permit application; 15 received only one objection; 3 received two objections; and only two received more than two objections. This apparent general acceptance of permit applications by agencies and the general public may be due to at least three things:

- o Permit applications may be carefully prepared by applicants to include mitigating measures, some of which may have been suggested by agencies, environmental groups, or through the media.
- o In some instances after initial review of the application, some agencies first make written "suggestions." If the permit application is revised to include the suggested mitigating measures, the agency does not formally object.
- o Most dredging/disposal permit applicants to NED/CE have previously had to obtain a license to dredge from the Connecticut Department of Environmental Protection; this may screen out many potentially objectionable elements.

Of the 14 agency objections, eight were objections to either dredging of intertidal marsh (3) or disposal on tidal wetlands (5). Of the remainder, two objected to dredging during June through September; one wanted dredging restricted in depth; one objected to a possible salinity change; one called for a long-range regional plan for the river basin prior to dredging; and one requested that an environmental impact statement be prepared. All but the last three received compliance, either as mitigating measures included in a revised application or as special conditions imposed by NED/CE.

Of the 16 general public objections, six were objections to open water disposal, with three of these noting a preference for upland disposal and one including an objection to lack of boundary clarity Single objections were made concerning: noise and water pollution; possible runoff and odor; adverse environmental and aesthetic impacts; and runoff that would encroach on neighbor's land. All of the above objections received response in the form of mitigating measures included in a revised application or special conditions imposed in the permit by NED/CE. Two single objections that did not receive a response are: a 10-year permit for maintenance dredging is too long, and dredging will cause siltation of the basin.

Clearly, it paid to lodge objections, because in most cases either the permit applicant was willing to include mitigating measures or NED/CE imposed special conditions on the permit which were responsive to the objection, or both.

Nine of the permits included dredging/disposal mitigating measures, meaning that the applicant submitted a revised form. Six were in response to formal objections; in the other three cases it can only be assumed the application was revised as a consequence of informal "suggestions." All but two of the 49 dredging/disposal permits include special conditions imposed by NED/CE; 20 of the permits received formal objections; the other 27 did not, but had special conditions imposed by NED/CE because of the nature of the proposed dredging/disposal. Again, it is clear that NED/CE is concerned about both responding to objections and to ensuring that all dredging/disposal projects are conducted in an acceptable manner.

2.4 Significant Impacts

Potential social, economic and environmental impacts have been assessed. An iterative process was followed in which preliminary scenarios for facilities were developed in coordination with NED/CE. These were used as a basis for discussion in personal and telephone interviews with concerned persons in the proposed site areas, to determine public attitudes. A preliminary assessment of potential impacts was made for 22 relevant attributes based on results of the interviews and telephone contacts, and CEM site visits. Separate sets of potential impact assessments were made for short-term impacts covering the dike construction and dredged material placement, dewatering, and surface shaping and planting, for both the primary impact area within one mile of the facility, and for the secondary impact area one mile to five miles around the site. Similar impact assessments were made for long-term impacts after completion of the facility, again for both primary and secondary impact areas. These preliminary potential impact results were communicated to NED/CE, followed by more detailed scenarios, revised to enhance the public acceptability of the containment facilities. The detailed scenarios were coordinated with NED/CE and used as a basis for a next round of more comprehensive assessment of potential impacts. The most significant of these impacts--both adverse and beneficial--are presented in highly summarized form in Table 2-3. (The summarized potential impacts in Table 2-3 include only the impacts judged "most significant." Many other potential impacts are presented in Sections 5 through 10, to which the reader is referred for a more thorough assessment.)

TABLE 2-3

SUMMARY OF POTENTIAL IMPACTS JUDGED "MOST SIGNIFICANT"

PROPOSED SITE	SHORT-TERM IMPACTS Impact Area *		LONG-TERM IMPACTS Impact Area	
	Primary	Secondary	Primary	Secondary
1. Fayerweather Island	• Disrupt existing oyster bed .	• Boating and construction hazards.	• Loss of some boat mooring space. • Loss of oyster bed.	--
2. Yellow Mill Channel	• Large populace adjacent during construction. • Indian pottery grounds nearby.	--	• Potential loss of mooring facilities. • Would satisfy strong need for recreation area. • Would reduce rat habitat.	• Would satisfy need for additional recreational area.
3. Morris Cove	• Oyster bed on perimeter may be disturbed.	--	• Would likely expand oyster habitat.	• Possible additional income for oyster fishermen.
4. Clinton Harbor	• Increase in marsh insects possible. • Shellfish area may be disrupted.	--	• Must have proper drainage of created marsh. • New marsh replaces marshes filled in past.	• New marsh replaces marshes filled in past.
5. Twotree Island	• Boating and construction hazard. • Visual appearance.	• Visual appearance. • Transport of large amounts of dike material.	• Wildlife habitat increased. • Man-made island covers hazardous shoals. • May cause siltation of Millstone II intake.	• Passive recreational and educational benefit derived from wildlife habitat.
6. Black Ledge	• Boating and construction hazard. • Visual appearance.	• Visual appearance. • Transport of large amounts of dike material.	• Wildlife habitat increased. • Man-made island covers hazardous shoals. • Passive recreational and educational benefit derived from wildlife habitat. • Visual appearance.	• Passive recreational and educational benefit derived from wildlife habitat.

*Primary impact area is one-mile radius; secondary impact area is one to five-mile radius.

Morris Cove

The use of an old borrow pit in the floor of Morris Cove in New Haven Harbor as a containment facility will have few, if any, social, economic or environmental impacts. The completed project would likely provide additional shellfish habitat.

Yellow Mill Channel

Converting the upper end of Yellow Mill Channel in Bridgeport Harbor into a containment facility with an end use as a recreational park also appears primarily beneficial, because both residents in the densely populated nearby housing project, as well as city officials have in the past voiced interest in having the channel filled.

Clinton Harbor

The dredging needs of Clinton Harbor could be met for the next 25 years by a 24-acre facility that would increase the size of an existing marsh When completed, channels through the marsh would have to be properly prepared to minimize insect breeding.

Fayerweather Island

The proposed Fayerweather Island facility, serving Bridgeport and Black Rock Harbors, would add bird and coastal wildlife habitat adjacent to an existing park and beach. However, a working shellfish area and some open water boat moorings would be displaced.

Twotree Island

Constructing a diked facility around the largely-submerged ridge called Twotree Island would eliminate a navigation hazard off the coast of Waterford. This 80-acre facility could serve the needs of New London Harbor and other nearby sources of dredged material for at least 15 years. Short-term boating and construction hazards are likely. Also, there would be a visual impact, although in its final condition, after vegetation, the island would appear similar to other rocky islands off the Connecticut shore. The completed site would be a habitat for birds and wildlife and provide passive recreational and limited educational opportunities for those willing to boat to the facility This site is being considered at the suggestion of local conservationists.

Black Ledge

The 11-million cu yd Black Ledge containment facility would be the largest of the six proposed. It would be constructed around a series of submerged rock prominences to the east of the mouth of the New London Harbor navigation channel. During the 9-month dike construction period, there would be considerable truck (unless rail is used) and barge traffic to move dike material from inland borrow pits to the

south. There could be resulting traffic congestion and boating and construction hazards. Once completed, the 190-acre facility would for many years visually appear as three 63-acre "lakes," as the average 22 ft of water in the facility is displaced by dredged fill material, and also later as the three cells of the facility are raised to the final height of 20 ft above Mean Low Water. Filling could take 30 years or more. When completed, the facility will provide bird and wildlife habitat; it was taken under consideration at the suggestion of local conservationists. The completed facility--or parts of it as completed--will appear similar to nearby Pine Island and Bushy Point island, which are vegetated and also somewhat more than 20 ft (at highest) above Mean Low Water. Who will own this man-made island, and what restrictions are placed on its use are important questions to be answered. Also, concern has been raised about the provision of police security, fire protection (after vegetation is established) and emergency medical help for anyone injured while on the island.

In concluding this summary of most significant potential impacts, the reader is reminded that detailed design, geological and benthic field tests, an environmental impact statement and a series of public meetings must be accomplished by NED/CE before implementation can begin. It is also important to note that Congress must review and appropriate funds for each project. Thus, many of the potential impacts described here may be subject to many other mitigating measures by NED/CE before implementation of a prototype dredged material project begins. For most of the prototype containment facilities under consideration, it is likely that at least six years will be required to carry out all of the necessary steps. Thus, implementation would begin no earlier than 1986.

2.5 Cost Analysis

A comparison of total costs and unit costs ($/cu yd) of the six proposed prototype dredged material containment facilities is given in Table 2-4.

Also included in the table are unit costs of disposing of the same volume of material by three alternative methods:

- Land Disposal: Assumes required acreage can be acquired at no cost within one mile of all required dredging, and hydraulic dredging and transport by temporary floating pipeline. Excludes possible costs of diking and water treatment.
- Long Island Sound Disposal: Assumes clamshell dredging and all disposal by barge at an average distance of 10 miles from the source of dredged material.
- Open Ocean Disposal: Assumes clamshell dredging and all disposal by barge at an average distance of 100 miles from the source of dredged material.

TABLE 2-4

COMPARISON OF PROPOSED PROTOTYPE DREDGED MATERIAL CONTAINMENT FACILITY COSTS AND COSTS OF ALTERNATIVES

Disposal Method	Dredging and Transport Method	Cost Item	Units	Containment Facility					
				Fayerweather Island	Yellow Mill Channel	Morris Cove	Clinton Harbor	Twotree Island	Black Ledge
Containment Facility	Hydraulic with Pipeline	Dredging	$ mil	1.410	0.500	0.900	0.310		
			%	31	29	58	27		
		Transport	$ mil	1.225	0.250	0.500	0.250		
			%	27	14	32	22		
		Construct.	$ mil	1.212	0.727	-	0.283		
			%	26	43	-	25		
		Disposal	$ mil	0.750	0.250	0.150	0.300		
			%	16	14	10	26		
		Total	$ mil	4.597	1.727	1.550	1.143		
		Unit Cost	$/cu yd	3.26	3.45	1.72	3.69		
Containment Facility	Clamshell with Barge	Dredging	$ mil			1.350		5.112	16.529
			%			50		13	18
		Transport	$ mil			1.215		9.450	31.146
			%			45		25	34
		Construct.	$ mil			-		22.397	38.000
			%			-		58	42
		Disposal	$ mil			0.150		1.500	4.850
			%			5		4	6
		Total	$ mil			2.715		38.459	90.525
		Unit Cost	$/cu yd			3.02		11.28	8.22
Land	Hydraulic with Pipeline (1 mile)	Dredging	$ mil	1.410	0.500	0.900	0.310	3.408	11.019
			%	54	50	56	44	50	60
		Transport	$ mil	0.500	0.250	0.250	0.250	1.750	1.750
			%	19	25	16	35	26	10
		Disposal	$ mil	0.705	0.250	0.450	0.155	1.704	5.510
			%	27	25	28	22	24	30
		Total	$ mil	2.615	1.000	1.600	0.715	6.862	18.279
		Unit Cost	$/cu yd	1.85	2.00	1.78	2.31	2.01	1.66
Long Island Sound	Clamshell with Barge (10 miles)	Dredging	$ mil	2.115	0.750	1.350	0.465	5.11	16.529
			%	36	36	36	36	36	36
		Transport	$ mil	3.807	1.350	2.430	0.837	9.202	29.752
			%	64	64	64	64	64	64
		Total	$ mil	5.922	2.100	3.780	1.302	14.314	46.281
		Unit Cost	$/cu yd	4.20	4.20	4.20	4.20	4.20	4.20
Ocean	Clamshell with Barge (100 mi)	Dredging	$ mil	2.115	0.750	1.350	0.465	5.112	16.529
			%	23	23	23	23	23	23
		Transport	$ mil	7.191	2.550	4.590	1.581	17.381	56.198
			%	77	77	77	77	77	77
		Total	$ mil	9.306	3.300	5.940	2.046	22.493	72.727
		Unit Cost	$/cu yd	6.60	6.60	6.60	6.60	6.60	6.60

The conditions for Long Island Sound (LIS) disposal and open ocean disposal are such that the unit costs are fixed at $4.20/cu yd and $6.60/cu yd, respectively.

It is noted that, in general, hydraulic dredging and floating pipeline transport over relatively short distances is always a cheaper way than clamshell dredging and barge transport, to move large volumes of dredged material. However, floating pipeline transport interferes with navigation and in the New England area is limited to two to three miles at most. Thus, for this cost analysis, only local dredging is assumed possible by hydraulic means.

The table shows that land disposal is the most economic in all six cases. However, the conditions assumed for land disposal may not be sufficiently realistic. For example, there is no assurance that, first, sufficient acceptable open land will be available within one mile of dredging, or, second, the local community will be agreeable to land disposal. It is important to recognize, however, that wherever the necessary conditions can be met, nearby land disposal is by far the most economic method of dredged material disposal.

In comparing the unit costs of disposal among the six sites, it is very apparent that disposal in the old borrow pit in Morris Cove in New Haven Harbor is the most economical at $1.72/cu yd. The reason, of course, is that no dike construction is required and a large volume of material can be accommodated (900,000 cu yd).

The containment facility with the next lowest unit cost of $3.26/cu yd is Fayerweather Island, which would serve Bridgeport Harbor and adjacent Black Rock Harbor. The unit cost is low because (1) the capacity of 1.4 million cu yd is relatively large; (2) the dike height is relatively low (only 15 ft above Mean Low Water, in an average depth of 5 ft); and (3) the facility will be filled by hydraulic dredge with floating pipeline transport.

The containment facility with the third lowest unit cost is Yellow Mill Channel in Bridgeport Harbor, at $3.45/cu yd. The unit cost is low here because only about 500 ft of dike would be required to seal off the channel and make it suitable as a containment facility. The unit cost of the Yellow Mill Channel facility is somewhat higher than the Fayerweather Island facility because its capacity of 500,000 cu yd is about one-third that of Fayerweather Island, and its dike is higher.

The proposed Clinton Harbor containment facility is next, with a unit cost of $3.69/cu yd--which is in the same $3 to $4/cu yd range as Fayerweather Island and Yellow Mill Channel. Unit cost for the 310,000 cu yd facility at Clinton Harbor is low because it is assumed that the dike will be formed by using hydaulically-pumped local

dredged material, rather than material taken from inland borrow pits, as would be done for all other dike construction. The use of locally dredged material for diking the Clinton Harbor facility is commensurate with its ultimate use as expansion of the existing marsh which it will abut.

The cost comparison table shows that the four poposed prototype containment facilities discussed above each have unit costs that are lower than alternative LIS disposal at an average distance of 10 miles or open ocean disposal at an average distance of 100 miles. This is due primarily to the fact that hydraulic dredging with local disposal is significantly cheaper than clamshell dredging with barge transport over a considerable distance.

The remaining two proposed prototype containment facilities--Twotree Island and Black Ledge--are much different from the previous four considered. Both would be constructed over rocky outcroppings in open water close to shore, rather than along a coastline or within a harbor. Both are large in area (80 and 190 acres, respectively) and both involve considerable dike construction entailing land and water movement of large volumes of suitable dike material from inland borrow pits, with commensurte high costs. The Twotree Island facility would be off the coast of Waterford and the Black Ledge facility would be on the east side of the Federal navigation channel at the entrance to New London Harbor. The dredged material to fill these facilities is assumed to be removed by clamshell dredging from sources within a 30-mile radius and barged to the site, where it would be dumped in a transfer basin and pumped by stationary hydraulic dredge and moveable pipeline to locations throughout the facility. When completed, both facilities would be filled to a height of 20 ft above Mean Low Water and would appear, when vegetated, as sizeable offshore islands, to be used as bird or other wildlife habitat.

The unit cost of dredged material disposal at the Twotree Island facility would be $11.28/cu yd, while it would be $8.22 at Black Ledge. The Black Ledge unit cost is less because, with a 11 million cu yd of capacity, it is more than three times larger than the 3.4 million cu yd capacity of Twotree Island, and there are economies of scale with increasing capacity, all other things being essentially equal, as they are here. Disposal in Long Island Sound at 10 miles from the dredged material source is approximately half or less expensive, compared to disposal in either the Twotree Island or Black Ledge containment facility, while open ocean disposal 100 miles distance is only somewhat more than half as expensive as disposal at Twotree Island, and about three-fourths the unit cost of Black Ledge disposal. As noted above, the principal

contributions to cost of the proposed prototype containment facilities in open water offshore are: (1) cost of dike construction (58 percent at Twotree Island and 42 percent at Black Ledge); and (2) the necessity to use the more expensive clamshell dredging and barge transport. On the positive side, the construction of either of these facilities would meet the dredged material disposal needs of northeastern Long Island Sound for 30 years or more, thus avoiding repeated controversy associated with open water disposal, while at the same time creating new bird and other wildlife habitat.

2.6 Recapitulation

The above impact and cost analyses clearly show:

- Of the proposed prototype dredged material disposal facilities, the use of an old borrow pit in Morris Cove, New Haven Harbor, has the lowest unit cost, but its 900,000 cu yd capacity will probably be filled in two or so years. It also has the least significant potential adverse social impacts.
- Yellow Mill Channel compares favorably with Fayerweather Island on a cost basis, in serving Bridgeport Harbor needs. Filling Yellow Mill Channel is a locally popular concept, and would have fewer adverse social impacts, because when completed it could provide additional recreational space in a densely populated urban area, whereas the Fayerweather Island facility would eliminate an area of active shellfishing. However, the Fayerweather Island facility would provide almost three times the capacity of Yellow Mill Channel. Disposal at either facility is more economic than open water disposal of dredged material from Bridgeport Harbor.
- The 24-acre Clinton Harbor containment facility would serve the harbor's dredging needs for 25 years, with little adverse social impact. Containment facility disposal would be more economic than open water disposal, while at the same time, it would replace local marsh area taken by filling in the past.
- The proposed Twotree Island and Black Ledge man-made island containment facilities would have unit costs higher than either Long Island Sound or open ocean disposal. They would be sizeable structures, each entailing several significant potentially adverse social impacts. On the positive side, construction of either would satisfy dredging disposal needs in northeastern Long Island Sound for 30 years or more, thus satisfying objections to the more economic open water disposal alternatives.
- Nearby land disposal is always the most economic method, if access to the land can be acquired at no cost; dikes and water treatment are not required; and dredging is done hydraulically. Public acceptance of land disposal may be difficult to obtain, even if land is available.

The reader should note that the social impacts and project costs discussed herein are highly tentative. The analyses presented in the remaining sections of this report are intended to provide a basis for discussion between the New England Division/Corps of Engineers and concerned public in the regions surrounding the proposed dredged material containment facilities. None of the proposed containment facilities will be implemented before the required preparation of detailed design, field investigations, and an environmental impact statement--along with concurrent public meetings--have been accomplished.

3.0 LONG ISLAND SOUND OVERVIEW: A FIFTY-YEAR PROJECTION (1985-2035)

3.1 Population Trends and Projections

The area surrounding Long Island Sound is one of the most densely populated regions of the United States. The shorefront region comprises four Connecticut counties with a 1980 population of 1,935,906 and a land area of 2,269 sq mi, and five New York counties with 6,532,852 people living on a land area of 1,810 sq mi. The average population density in the Connecticut shore counties is 853/sq mi, while in the five New York shore counties, it is 3,609/sq mi.

It is probably more accurate to use the entire state of Connecticut, all of New York City, and Nassau, Suffolk and Westchester Counties as the region served by Long Island Sound. Combined, the larger region had a population of 13,651,018 in 1980 on a land area of 6,823 sq mi, giving an average population density for the sixteen-county region of 2,000/sq mi.

The nine-state Northeast remained essentially at 49 million people during the Seventies, with an overall population growth of 137,000, as shown in Table 3-1, where the northeastern states are compared with the U.S. and growth states such as California and Florida. During this period, the remainder of the nation grew by over 23 million. Within the Northeast, the New York City region (eight New York counties) bore the brunt of changing population patterns, losing 802,000 over the decade. Population increases occurred only in Richmond (Borough of Staten Island) and Suffolk Counties, with losses of about 100,000 to 300,000 in five counties and a 28,000 population loss in Westchester County, as shown in Table 3-2. Connecticut experienced a modest 2.5 percent population increase (75,000), comparable to the rate of increase in New Jersey. Pennsylvania and Massachusetts had slight population gains, while Rhode Island lost about 2,500 people. Table 3-3 shows that Connecticut experienced more than two-thirds of its Seventies' growth in the four counties on Long Island Sound. The three northern New England states experienced growth rates higher than the national average, but the gain in actual numbers was only about 300,000, which was much less than the 633,000 lost by the State of New York.

With these contrasting conditions, it is understandably difficult to make projection for the Long Island Sound region with any degree of sophistication or accuracy, because it comprises Rhode Island and eight New York counties (of which six lost population) and Connecticut, which saw only a modest growth of 2.8 percent in its four counties bordering the Sound, and less than that statewide. If the 1985-2035 population projection for the region were to be based on the last ten years, it would show significant decline, for the eight New York counties that constitute the New

TABLE 3-1

POPULATION GROWTH DURING THE SEVENTIES IN NEW ENGLAND AND THE NORTHEAST, COMPARED WITH CALIFORNIA, FLORIDA, AND THE U.S.

State	1980 Population	1970 Population	Change	Percent Change
1. Connecticut	3,107,576	3,032,217	75,359	2.49
2. Massachusetts	5,737,037	5,689,171	47,867	1.01
3. Rhode Island	947,154	949,723	-2,569	-0.27
4. Maine	1,124,660	993,663	130,997	13.18
5. New Hampshire	920,610	737,681	182,929	24.80
6. Vermont	511,456	444,732	66,724	15.00
New England	12,348,493	11,847,186	501,307	4.23
7. New York	17,557,288	18,190,740	-633,452	-3.48
8. New Jersey	7,364,158	7,168,164	195,994	2.73
9. Pennsylvania	11,866,728	11,793,909	72,819	0.62
N.Y., N.J., PA	36,788,174	37,152,813	-364,639	-0.98
Northeast	49,136,667	48,999,999	136,668	0.28
10. California	23,668,562	19,953,134	3,715,428	18.62
11. Florida	9,739,992	6,789,443	2,950,549	43.46
United States	226,504,825	203,235,298	23,269,527	11.45

Source: Bureau of the Census.

TABLE 3-2

POPULATION AND HOUSING GROWTH DURING THE SEVENTIES IN THE NEW YORK CITY REGION AND NEW YORK STATE

County	Population				Housing			
	1980	1970	Change	%	1980	1970	Change	%
1. Bronx	1,169,115	1,471,701	-302,586	-20.6	451,053	508,789	-57,736	-11.3
2. Kings (Brooklyn)	2,230,936	2,602,012	-371,076	-14.3	881,367	902,622	-21,255	-2.3
3. New York	1,427,533	1,539,233	-111,700	-7.3	754,549	714,593	39,956	5.6
4. Queens	1,891,325	1,987,174	-95,849	-4.8	740,129	708,816	31,313	4.5
5. Richmond (Staten Is.)	352,121	295,443	56,678	19.2	119,000	89,961	29,039	32.3
Subtotal for New York City	7,071,030	7,895,563	-824,533	-10.4	2,946,098	2,924,781	21,317	0.8
6. Nassau	1,321,582	1,428,838	-107,256	-7.5	434,045	410,379	23,666	5.8
7. Suffolk	1,284,231	1,127,030	157,201	13.9	431,722	335,041	96,681	28.9
Subtotal for Long Island	2,605,813	2,555,868	49,945	2.0	865,767	745,420	120,347	16.1
8. Westchester	866,599	894,406	-27,807	-3.1	316,658	291,550	25,108	8.6
Total for New York City Region	10,543,442	11,345,837	-802,395	-7.1	4,128,523	3,961,251	167,272	4.1
Total for New York State	17,557,298	18,190,740	-633,452	-3.5	6,866,851	6,299,684	567,167	9.0

Source: U.S. Bureau of the Census.

TABLE 3-3

POPULATION AND HOUSING GROWTH
IN THE COUNTIES AND STATE OF CONNECTICUT

County	Population				Housing			
	1980	1970	Change	%	1980	1970	Change	%
1. Fairfield	807,143	792,814	14,329	1.8	295,065	254,618	40,447	15.9
2. New Haven	761,337	744,948	16,389	2.2	287,184	242,851	44,333	18.3
3. Middlesex	129,017	115,018	13,999	12.2	51,220	38,608	12,612	32.7
4. New London	238,409	230,654	7,755	3.4	90,271	73,475	16,796	22.9
Subtotal for LIS Counties	1,935,906	1,883,434	52,472	2.3	723,740	609,552	114,188	18.7
5. Litchfield	156,769	144,091	12,678	8.8	61,786	51,052	10,734	21.0
6. Hartford	807,766	816,737	-8,971	-1.1	300,683	262,381	37,302	14.4
7. Tolland	114,823	103,440	11,383	11.0	38,039	29,735	3,304	27.9
8. Windham	92,312	84,515	7,797	9.2	34,636	28,383	6,253	22.0
Subtotal for North Counties	1,171,670	1,148,783	22,387	2.0	435,144	372,051	63,093	17.0
Connecticut	3,107,576	3,032,217	75,359	2.5	1,158,384	981,503	177,281	18.1

Source: U.S. Bureau of the Census.

York City region lost a net of about 802,000 and the four Connecticut counties bordering the Sound gained a net of only about 52,000, for a net loss of 750,000 over the decade. It is unlikely that the Long Sound region will continue to lose population at an average rate of 75,000 per year for the next fifty years; that would be a loss of nearly four million people out of a total of about 13.6 million (counting all of Connecticut and the eight New York counties). However, until the 1980 census data were available, few would have suggested that the region's population of more than 14 million in 1970 would have dropped by over 5 percent in just ten years.

These statistics are presented to emphasize the point that the population growth pattern experienced by the Long Island Sound region since the end of World War II is one of significant growth up through 1970 in Connecticut and Nassau, Suffolk, and Westchester Counties, but showed little change in New York City population. However, in the Seventies New York City, Nassau and Westchester Counties lost population, while Connecticut grew only slightly, while Suffolk County increased at slightly above the national growth rate. The population figures and changes are given in Table 3-4 and further illustrated in Figure 3-1, which also shows some possible ranges of growth through 2050 based on three typical scenarios, as follows.

TABLE 3-4

POPULATION GROWTH IN THE LONG ISLAND SOUND REGION

Region	Population				Change			Percent Change		
	1950	1960	1970	1980	1960-1950	1970-1960	1980-1970	1960-1950	1970-1960	1980-1970
Four Connecticut Shore Counties[1]	1,262,279	1,588,514	1,883,434	1,935,906	326,235	294,920	52,472	25.8	18.6	2.8
Four Connecticut Inland Counties[2]	745,001	946,720	1,148,783	1,171,670	201,719	202,063	22,887	27.1	21.3	2.0
Connecticut	2,007,280	2,535,234	3,032,217	3,107,576	527,954	496,983	75,359	26.3	19.6	2.5
New York City[3]	7,891,957	7,781,984	7,895,563	7,071,030	-109,973	113,579	-824,533	-1.4	1.5	-10.4
Nassau-Suffolk Counties	948,894	1,966,955	2,555,868	2,605,813	1,018,061	588,913	49,945	107.3	29.9	2.0
Westchester County	625,816	808,891	894,406	866,599	183,075	85,515	-27,807	29.3	10.6	-3.1
New York City Region	9,466,667	10,557,830	11,345,337	10,543,442	1,091,163	788,007	-802,395	11.5	7.5	-7.1
Long Island Region	11,473,947	13,093,064	14,378,054	13,651,018	1,619,117	1,284,990	-727,036	14.1	9.3	-5.1
United States	150,697,361	179,323,175	203,235,298	226,504,325	28,625,814	23,911,937	23,269,527	19.0	18.4	11.5
Long Island Region as a Percent of U.S.	7.6	7.3	7.1	6.0	5.7	5.4	-3.1	N.A.[4]	N.A.	N.A.

[1]Fairfield, New Haven, Middlesex, New London counties.

[2]Litchfield, Hartford, Tolland, Windham counties.

[3]Bronx, Kings, New York, Queens, Richmond counties

[4]N.A. = Not Applicable.

Source: U.S. Bureau of the Census.

In the first scenario, assume population continues to decline in the New York City region for the next 20 years, but at an increasingly lower rate until a minimum is achieved in 2000, and then remains essentially stable through 2035. For the second scenario, assume a minimum in population occurred in 1980, and that a very modest growth of two percent per decade will be achieved through 2035. In the third scenario, assume that growth in the next decade is one percent, and that the growth rate increases by one percent in each succeeding decade.

In Scenario 1, we might assume an additional population loss of about 600,000 over the next 20 years, with a stable population of about 12.7 million from 2000 to 2035. Scenario 2 would result in a population of about 14.8 million by 2035--an increase of about 15 percent over the 1980 population. Scenario 3 produces a population of nearly 16 million for the region by 2035--an increase over the (55-year) period of 19.3 percent, or an average of about 0.32 percent per year.

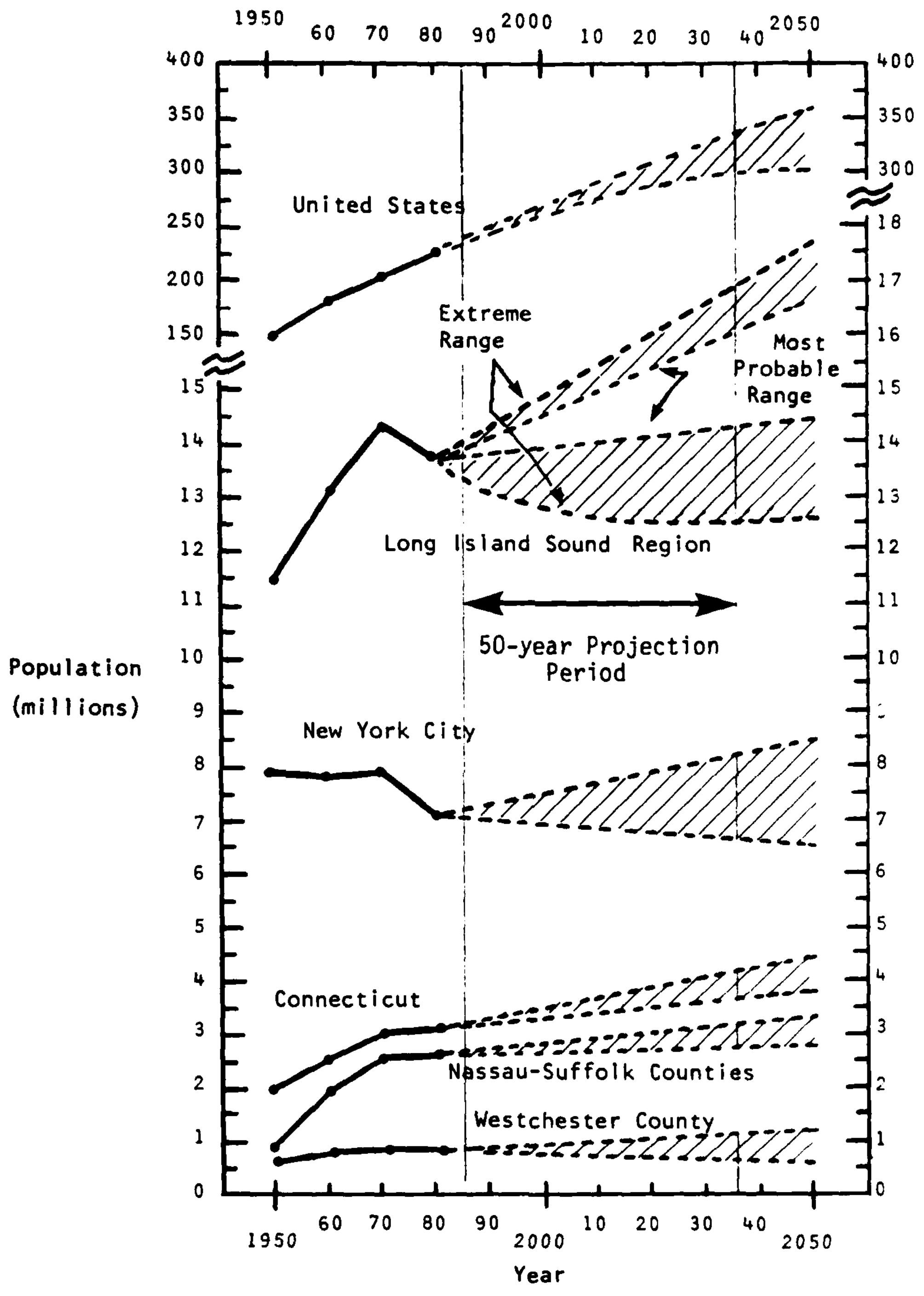

Figure 3-1. Population growth and possible projections: 1950-2050.

These three population scenarios are representative of a spectrum of possible population futures that could be in store for the Long Island Sound region. Which growth pattern the region may follow cannot be stated with any degree of certainty at this time. It is probably reasonable to suggest that the Connecticut shore counties will continue their slow growth for the next two or three decades. Suffolk County, which grew 13.9 percent during the Seventies, will probably continue growing at least by one percent per year for one or two decades. The other New York counties are likely to reverse their decline in growth within the next decade, and begin a modest positive growth in the years beyond.

The reasons for the recent marked changes in population growth in the Long Island Sound region are several, but crowding, the high cost of energy, the high cost of living and the decline of employment in manufacturing, trade and other activities in New York City are all major contributors caused in part by three national recessions during the Seventies. Connecticut has done much better than the New York City region in maintaining a growth momentum. Unfortunately, there is considerable probability that much of the even modest population and employment growth Connecticut may experience in the Eighties and Nineties and beyond may be at the further expense of New York City. At least in the near-term, the recent growth in Hartford of employment in national insurance companies and today's surge of high rise office building construction are apt to look attractive to New York City-based firms, some of which have already moved to southwestern Connecticut. Continued inflation, higher taxes, an energy shortage and/or a dramatic increase in energy cost, or a long string of cold winters--any of these events or some combination of them could stimulate a further exodus of firms from New York City. Depending on conditions, they might move north to Connecticut or west to New Jersey, or they could leave the Northeast for a setting elsewhere that is more hospitable in terms of costs of labor, overhead, taxes, energy consumption and general quality of life.

Under the most pessimistic realistic scenario it appears unlikely that the eight to sixteen-county region around Long Island Sound will have a lower population in 2035 than it does today. Conversely, even under relatively optimistic conditions, it does not appear today that the region may grow more than an average 3 percent per decade, which would lead to a population of about 15.5 million in 2035, or an increase of about 14 percent.

3.2 Effect of Energy Consumption and Energy Technology Trends

Growth in the Long Island Sound region is directly related to the cost of energy. The region grew rapidly when energy was cheap. It has experienced a loss of population and industry as energy (and labor and taxes) became more expensive during the Seventies. The status of energy in the Long Island Sound region over the next 55 years will probably be divided into three overlapping phases:

- o Phase 1: Energy conservation - 1980 to 1995.
- o Phase 2: Energy generation conversions: 1980 to 2005.
- o Phase 3: New sources of energy - 1995 to 2035.

Each of these phases is discussed briefly below.

Phase 1: Energy Conservation - 1980 to 1995

Today, the most cost effective way for most people and firms to combat the high cost of energy is to take the many simple measures that reduce the amount of energy used. Already many residents in the Long Island Sound region have lowered thermostats, insulated homes, and begun to follow recommended practices which reduce the general use of electricity. Electrical generation, as well as the rates of consumption by residential, commercial, and industrial customers throughout the Northeast, has remained almost constant throughout the 1976-1979 period. In Connecticut during 1973-1978 the consumption of energy by all sectors remained virtually unchanged. Much of that constancy in energy use can be ascribed to conservation, because in the New England states, the number of residential and commercial electrical customers has increased, while the number of industrial customers has remained approximately constant. In New York, the number of residential and industrial electrical customers increased modestly between 1973 and 1979, while the number of commercial customers declined. Electrical consumption increased somewhat in all three categories during the period. These comments clearly illustrate that the era of electrical consumption growth rates of about seven percent per year (a doubling of consumption every decade) is a thing of the past. For example, throughout the entire U.S., the annual growth rate of electrical consumption between 1973 and 1979 was about 4.1 percent. However, in Connecticut it was about 1.9 percent and in New York it was less than 1.5 percent. Energy conservation and low population growth (or decline, in the case of New York) both contribute to these changing energy consumption patterns.

Phase 2: Energy Generation Conversions - 1980 to 2005

In the electrical generation area, two or three major events will occur over the next 10 to 25 years. First, a number of small, old steam-electric power plants that once burned coal and were converted to oil to meet the requirements of the 1970 Clean Air Act will be converted back to coal. The Brayton Point (Fall River, Massachusetts) station of the New England Electric Company has already been reconverted and is using coal today. There is also a coal-burning electric power plant in New Hampshire, on the outskirts of Concord, and another on the coast of Maine. However, the total amount of coal that might pass through Long Island Sound ports over the next 10 years is unlikely to exceed 6 or 7 million tons/year and may be as little as 1 or 2 million tons or less, depending on the speed with which coal conversions by electric utilities and industry are made. The coal to be burned will be low sulfur (one percent or less), which may require that it be obtained from the western Virginia, West Virginia, or eastern Kentucky coal fields. Such coal is relatively expensive. However, in terms of cost per million Btu of energy, it will probably be half or less the cost of the residual fuel oil now used.

Second, sometime in the late 1980's it is expected that the Millstone 3 nuclear power plant will come on line. It will provide 1,280 megawatts of capacity, and will doubtless replace some of the more expensive oil- and coal-fired units in New England. The Shoreham Nuclear Power Station of the Long Island Lighting Company is due to become operational in 1981. In addition, the two nuclear plants at the Seabrook site in New Hampshire are scheduled to add about another 2500 megawatts of capacity in the Eighties. Sometime in the Nineties, there will likely be at least one large (i.e., about 1000 megawatts) steam-electric power plant constructed in New England, primarily to replace aging, inefficient units. It will probably be coal-fired and may very likely be built at some convenient central coastal location, such as Quonset Point, Rhode Island. Such a plant might use a coal gasification combustion units, such as that being tested by Combustion Engineering in Windsor Locks, Connecticut. Or, it might use a fluidized bed combustion unit. Another possibility is low sulfur char from a New England coal liquefaction plant which may be operational near the turn of the century. It is important to recognize that New England and New York, now with a total of over 52 gigawatts of capacity, and a near-zero-population growth, presently have at least 5 gigawatts of capacity due to become operational in the Eighties--all of it nuclear. The need for additional electric utility capacity in this century--beyond that already planned and under construction--is questionable, unless there is a significant resurgence of population growth. In fact, it is not clear that much not-presently-planned

new electrical utility generating capacity will be required by 2000, except for old equipment replacement, if some of the other changes in energy generation take place, as discussed next.

New England and New York have no significant indigenous sources of energy—except sunlight, wind, biomass, and hydropotential. Each of these is discussed briefly below.

Solar

Direct solar energy for space heating has yet to achieve the wide scale acceptance it needs to become a major growth industry. It has not yet been accepted on a broad basis, either by residential builders or commercial architects, primarily because of the cost associated with the solar panels and the required backup system. Present solar residential space heating systems may add $12,000 to $25,000 to the cost of a new house, and retrofits would be more expensive. Since it would be uneconomical to design for more than about 50 to 60 percent of a home's heating needs, a full-sized backup heating system is usually required. Hence, the solar system pay-back period may easily be greater than 20 years, unless the combination of federal, state and local tax incentives are more significant than they are today.

Solar hot water systems are more economically advantageous. They can be designed to totally satisfy needs in the summer, and system backup in winter can be achieved by using a hot water storage tank with an electrical heater element, adding little to the total system cost. Payback periods of five to ten years are possible

Use of direct solar energy is apt to experience a significant surge of interest, when solar photovoltaic systems reach the stage of production line economies. The fact that only simple wiring (rather than insulated pipes or ducts) is needed to transport energy to wherever it is to be used reduces the cost of installation in new homes and makes retrofitting older homes more tractable. Solar photovoltaic systems could supply energy to the same electrical resistance in a hot water tank that is also supplied by the backup connection, thus reducing storage system cost. There are a number of ways that solar photovoltaic energy might be stored for space heating use.

Wind

While direct solar energy may have to wait for economic photovoltaic systems to become popular in the Northeast, windmills may move ahead at a more rapid pace. Various DOE and NASA wind energy demonstration programs have met program goals, and an 80 megawatt wind farm, consisting of 20 4-megawatt wind machines is to be built in the Kahuka Hills, Oahu, Hawaii. There the winds exceed 12 mph more than

three-fourths of the time. The wind machines will be build by Hamilton Standard in its new blade winding facility in East Granby, Connecticut. Southern California Edison has plans for adding 360 megawatts of wind energy to its grid by 1990. The Long Island Sound shores, where average winds of 12 mph or more are available, may be the sites of wind machines installed in the Nineties and beyond.

Biomass

The biomass potential of the Long Island Sound region is not great, in part because the area is small--5,000 to 10,000 sq mi, depending on how the region is defined—and also in part because the region is densely populated. For example, Connecticut averages 600 people/sq mi, and Nassau and Suffolk Counties together average over 2000 people/sq mi. Conservatively the woodlands of Connecticut might sustain a wood yield that would support 100 to 200 megawatts of electric generating capacity. The outer counties of Long Island, with one-fourth the area of Connecticut, more than twice the population density, and generally poorer soil conditions do not appear to offer a viable biomass resource of great significance.

Hydropotential

There is not much economical hydropotential in the Long Island Sound region. There is essentially none on Long Island because of its low elevation and porous soils, and in Connecticut, Northeast Utilities cites less than 15 megawatts of new capacity they propose to consider as part of their conservation program for the 1980's and 1990's, to reduce dependence on foreign oil by 90 percent by 1993. Larger amounts of hydropower are possible—for example, by one or more dams on the Connecticut River--but resistance by various interest groups to any new structures and impoundments is bound to be great. Furthermore, the initial investment is very high, considering that a capacity factor of about 30 to 40 percent is the best that might be expected for most hydro facilities in Connecticut.

Cogeneration

One potential indigenous "energy source" in any region could be cogeneration, which is actually a form of energy conservation, in which a "topping" or "bottoming" electrical generation cycle may be added to an existing system, which usually produces process steam or other hot gases. Cogeneration is mentioned here for completeness. There is not sufficient industrial use of process steam or hot gases in the Long Island Sound region, other than electrical generation by utilities, for this concept to play a highly significant role in the future.

Phase 3: New Sources of Energy - 1995 to 2035

The next century may see the commercial realization of new ways to obtain and convert energy. By the twenty-first century, the commercial viability of magnetohydrodynamics (which burns coal) and fusion may be well in hand. If ocean thermal energy conversion (OTEC) is demonstrated to be economically viable, it is likely that it may be the start of a hydrogen economy, because that may be a good way to store and transport the OTEC-generated energy. There is considerable likelihood that many of today's "new concepts" will have reached the stage of early commercialization by 2000. These include but are not limited to coal gasification, coal liquefaction, recovery of oil from shale, as well as very large windmills and various types of solar systems. Other possibilities include breeder reactors and synchronous orbit solar receivers which transmit electrical energy to the earth by microwave, as well as magnetohydrodynamics and fusion, mentioned above.

It is important to recognize three points:

1. As we move into the 21st century, it is likely that most of the energy used will still be of fossil origin.
2. No known source or form of energy in prospect for the future will be cheaper than today's sources.
3. Most of the benefits to be expected from home, commercial, and industrial retrofitted energy conservation will have been captured before the end of this century.

Since energy has great prospects of becoming increasingly expensive over the long term, it may be suggested that the future will continue to see a reduction in the size of automobiles, an increase in miles-per-gallon automobile efficiency, and at least some modest increase in the availability of mass transportation. (Apparently, energy supplies may have to be seriously curtailed before Americans will make significant changes in transportation modes.) New housing units are apt to become smaller, on average, and much more energy-efficient, with considerable emphasis on passive solar heating and possibly with heating and cooling provided by some form of active solar-assisted heat pump.

3.3 Industrial and Commercial Trends

Employment in Connecticut: 1970-1980

While Connecticut remained at near zero population growth during the Seventies (it added 75,000 in population, or only 2.5 percent), the statewide labor force increased by 18 percent, to 1,616,000. In ten years, nonagricultural employment grew 19 percent to about 1,424,000 in 1980, or nearly 46 percent of the population. This growth occurred entirely in the nonmanufacturing sector, which saw employment increase in every year between 1970 and 1980--a shift from 756,000 up to 983,000, respectively. This is a gain of 227,000 jobs and an increase of 30 percent in 10 years. Manufacturing employment was 442,000 in 1970 and after dipping to lows of 399,000 in 1971 and 390,000 in 1975, it had five years of steady growth back to 442,000 in 1980, ending the Seventies where it began. In the manufacturing sector, nearly three-fourths of employment is in the category of Metal and Its Products, with the remainder in Nonmetallic Manufacturing. These proportions remained approximately constant during the Seventies.

In 1970, manufacturing provided about 37 percent of the nonagricultural employment in Connecticut. By 1980, although the number employed was the same, only 31 percent of the workers were employed in manufacturing.

The nonmanufacturing sector in Connecticut experienced a 30 percent increase in employment between 1970 and 1980. The bulk of that growth came in the subsectors of Trade; Finance, Insurance, and Real Estate; and Services. Employment in these activities grew by 33, 42, and 55 percent, respectively. Other subsectors in nonmanufacturing are Construction, which experienced a 14 percent decline in employment; Transportation, Communications, and Utilities, which grew only 13 percent; and Government, which grew 16 percent. Because of their direct bearing on growth of activity in the Long Island Sound region from now through 2035, each of the subsectors is discussed in detail in Appendix C.

Impact of Population Change in the New York City Region: 1970-1980

For the purposes of discussion here, the New York City region is assumed to comprise eight counties: Bronx, New York, Queens, Kings (Brooklyn), and Richmond (Staten Island), which constitute New York City; Nassau and Suffolk, which account for the outer portion of Long Island; and Westchester, which lies between Long Island Sound and the Hudson River, and also between New York City and southwestern Connecticut.

These eight counties went through some remarkable changes in the Seventies. Six of the counties lost a total of 988,000 people. The other two gained some of this population—Richmond (the Borough of Staten Island) added about 57,000 and Suffolk increased by about 157,000. The net population loss in New York City (five borough-counties) was over 824,000, or more than 10 percent of its 1970 population of 7,895,000. Nassau County lost over 107,000, probably much of it to the 157,000 gained by Suffolk County, leaving a small net gain of about 50,000 for Nassau and Suffolk Counties together, or a regional increase of 2 percent over the combined 1970 population of 2,556,000. Westchester County lost nearly 28,000, down more than 3 percent from the 1970 populatioin of 894,000.

The New York City region, as defined here, entered the Seventies with about 11,346,000 people, and experienced a loss over the decade of 802,000 (or, 7.1 %), leaving it at 10,543,000 in 1980. Population losses of over 300,000 occurred in both the Bronx and Brooklyn (Kings County), while losses of over 100,000 each occurred in Queens and Nassau Counties.

There is no other equally large densely populated region in the U.S. that suffered population loss in the Seventies equal to that of the New York City region. Since population and employment are highly correlated, it is not surprising that the New York City region suffered considerable employment loss during the decade, as described next.

Employment Trends in the New York City Region: 1970-1980

The New York City region, as defined here, had about 4,776,000 nonagricultural employees in 1970, or jobs equal to about 42 percent of its population of 11,346,000. By 1980, employment had dropped 212,000 (-4.4 %), but then stood at over 43 percent of a population reduced to 10,543,000. The reduction in employment occurred in New York City, which lost 448,000 jobs in the Seventies. There was a decline in employment in New York City in all major sectors except Services (up 13 %) and State Government employees, which rose 29 percent. A net gain of 188,000 jobs occurred in Nassau-Suffolk Counties (25.9 %), and there was a gain of 48,000 jobs in Westchester County (15.8 %), even though population declined by 28,000.

Nonagricultural employment per capita in New York City was at 47.5 percent in 1970, and only dropped to 46.6 percent in 1980. However, in Nassau-Suffolk Counties, the nonagricultural employment per capita went from 28.4 percent to 35.7 percent in the Seventies, while population increased only 2 percent. And, Westchester County saw nonagricultural employment per capita go from 34 percent to 40.6 percent in the

same period, along with its small population decrease. In contrast, Connecticut went from about 40 percent of the population in nonagricultural employment in 1970 to nearly 46 percent in 1980, while showing a slight increase in population.

The rather general statements above are meant to set the stage for the more detailed discussion of employment changes by sector given in Appendix C. Because it is important as a basis for making projections for the Long Island Sound region, information is presented in Appendix C for each employment sector for New York City, Nassau-Suffolk Counties, Westchester County, and the entire New York City region.

Summary and Conclusions for the New York City Region

The New York City region no longer holds the same attractions for population, industrial, and commercial growth that it had in the Fifties and Sixties. It is expensive and dangerous, and its physical plant continues to fall further into disrepair. It probably can be saved, but very possibly only through the mechanism of massive amounts of federal aid--something that may not be readily available during the Eighties.

On the bright side, it does not appear likely that the New York City region will lose another 800,000 people during the Eighties. However, higher taxes, increased energy costs, and a string of several years of abnormally cold winters could create an environment that would stimulate citizens to leave and business decision makers to shift their industrial and/or financial activities to regions where labor and overhead costs and taxes are lower, and environmental conditions more benign. The projection that the region will not continue its population loss is based in part on the small, but steady, employment growth which the City has experienced since 1977, when it passed through its low point of 3,182,000 employees--down 564,000 from 1970. By 1980, 116,000 jobs had been recovered. However, at the end of the Eighties, employment in the region was still declining from year to year in several sectors: Manufacturing, Transportation/Communications/Utilities, Wholesale and Retail Trade, and Government. Only in Finance/Insurance/Real Estate and Services was there a strong growth trend. Clearly, there is little reason to believe that these employment sectors will sustain a sufficiently vigorous growth trend to surmount continued employment losses in all the other sectors. Therefore, there is a reasonable probablilty that New York City will see new lower levels of employment at some time in the Eighties, probably when the national economy experiences its next recession. It could come earlier, should employment decline in the industrial sector increase even more, or a number of

financial institutions and/or corporate headquarters decide to move outside the region. Paradoxically, a significant increase in available office space in Connecticut--construction for which is now underway in the Hartford region--might contribute materially to further employment decline in New York City, for it could create a ready-made opportunity for firms to move into new, modern facilities and live nearby in a relatively rural (or, at least suburban) setting.

Looked at from another point of view, a coalition of city, state, and federal agencies might create an alternative environment which stimulates the participation of industry, finance, and commerce in the rebuilding of New York City. While that may not occur immediately, it might be possible towards the end or at the turn of the century. To be effective it would probably have to occur on a massive scale, resulting in significant replacement or rehabilitation of much of the physical plant in New York City, and would likely involve new, efficient concepts in the movement of goods and people throughout the City. As a beginning, it would probably involve a sustained construction and rehabilitation program lasting one or two decades, or more. Beyond that, the mix of industrial, trade, financial and services employment lies in the hands of the planners and the choices of decision makers. The New York City region is unique within the nation. It may well take a national effort to give it sustained new life and growth.

4.0 ANALYSIS OF DREDGING PERMITS IN CONNECTICUT

4.1 Purpose and Background

Purpose

The purpose of this section is to analyze in detail available information on 1979 and 1980 permit applications to NED/CE for dredging/disposal in Connecticut to determine (1) the proportion of permit applications which received objections; (2) the nature of the objections; (3) the agencies and private sources of the objections; (4) the mitigating measures included in the revised permit applications; and (5) special conditions imposed by NED/CE in the issued permit. The valuable factual information derived from this analysis was needed to help formulate the final construction scenarios, to assist in the selection of impact attributes to be used in evaluating the potential social and economic impacts of DMCFs, and as background for judging the degree of impact of some aspects of the implementation of dredged material containment facilities.

Background

Under Work Order No. 6 of this contract, CEM conducted an analysis of 765 NED/CE permits for proposed development activities relating to navigable waters in New England, issued in 1979 and 1980.* The purpose of that study was to estimate how many of those permits might have been suitable for issuance as a general permit, rather than an individual permit. General permits can be issued when the proposed development activity is of a suitable type, size and location such that there are no significant environmental impacts. They require much less staff effort and processing time.

CEM analyzed in detail the characteristics of 542 single-activity permits, including: the nature of formal objections made by federal, state and local agencies and the public; the nature of short-term and long-term potential environmental impacts; special conditions imposed in the permit by NED/CE; and mitigating measures which the applicant incorporated in the revised application as a result of formal and informal objections, thereby helping to achieve issuance of the permit by NED/CE.

The study determined there were 101 single-activity dredging/disposal permits for New England projects issued by NED/CE in 1979 and 1980. Of these, 96 were found appropriate for a detailed analysis which appears as Section 4 in CEM Report 4280-06-732, **General Permit Study for the Six New England States.** A slightly modified version of Section 4 (Analysis of Single-Activity Permits for Dredging/Disposal) appears in Appendix D of this report.

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*J. C. Knoop, et al., CEM Report No. 4280-06-732, **General Permit Study for the Six New England States,** August 1981.

Of the 101 permits for dredging/disposal issued in New England in 1979 and 1980, forty-two of the ninety-six single-activity permits were issued for projects in Connecticut in 1979 and 1980. In addition to these forty-two Connecticut permits, there were seven other permits issued involving dredging/disposal and one or more other actions. Presented below are detailed analyses of these forty-nine Connecticut dredging/disposal permits.

4.2 General Analysis of Connecticut Permits

Table 4-1 summarizes some of the general characteristics of all NED/CE permits for projects in navigable waters in Connecticut in 1979 and 1980. The following are highlights that can be extracted from Table 4-1.

- o 187 permits were issued by NED/CE for all types of projects in Connecticut in 1979 and 1980.
    - Of these, 117 (63 %) received no formal objections.*
    - Permits were issued for projects at 58 locations.
- o 49 of the 187 permits involved dredging/disposal.
    - Of these, 29 (59 %) received no objections to dredging/disposal.
    - Dredging/disposal permits were issued for projects at 23 locations (40 %).
- o 90 of the 187 permits (48 %) occured at 10 locations:

1. Groton	6. New Haven
2 Milford	7. Darien
3. Clinton	8. New London
4. Norwalk	9. Stonington
5. Old Saybrook	10. Mystic

- - 27 dredging/disposal permits (55 %) were issued for the top 10 locations, noted above.
- - There were 36 locations (62 %) at which only one permit was issued.
    - -- Only at one of these 36 locations was the permit issued for dredging/disposal.

For our purposes, Table 4-1 can be briefly summarized by noting three points:

- o The 49 dredging/disposal permits comprised 26 percent of all NED/CE permits in Connecticut in 1979 and 1980.
- o Dredging/disposal permits were free of objections to approximately the same degree as all permits (about 60 %).
- o Dredging/disposal was permitted at 23 of the 58 locations (40 %) for which permits of all types were issued.

*It is noted that some agencies, especially the Environmental Protection Agency, Bureau of Sports Fisheries and Wildlife, and National Marine Fisheries Service, often sent "suggestions" in letter-form to the permit applicant, detailing special conditions which they recommended for inclusion in the permit application. If the application was then revised and resubmitted incorporating these "suggestions," no formal agency objection is raised.

TABLE 4-1
CHARACTERISTICS OF ALL NED/COE PERMITS ISSUED
FOR ALL PROJECTS IN CONNECTICUT IN 1979 AND 1980

No.	Port/City/Town	Total No. of Permits	No. of Dredging Permits	Total No. of Objections	Total No. of Dredging Objections	No. of Permits With no Objections	No. of Dredging Permits With no Objections
1.	Groton	14	6	33	2	10	3
2.	Milford	13	4	5	1	9	3
3.	Clinton	10	6	12	5	4	2
4.	Norwalk	9	3	37	3*	4	1
5.	Old Saybrook	9	1	1	0	8	1
6.	New Haven	8	2	1	0	7	2
7.	Darien	7	4	3	1	4	3
8.	New London	7	1	4	0	4	1
9.	Stonington	7	0	5	n.a.	3	n.a.
10.	Mystic	6	0	10	n.a.	2	n.a.
11.	Bridgeport	5	0	0	n.a.	5	n.a.
12.	Riverside	5	1	22	0	4	1
13.	Westbrook	5	3	12	5	2	2
14.	Westport	5	1	5	0	4	1
15.	Branford	4	1	2	1	2	0
16.	East Norwalk	4	4	2	2	2	2
17.	Madison	4	0	7	na.a	1	n.a.
18.	Greenwich	3	1	4	0	2	1
19.	Haddam	3	1	0	0	3	0
20.	Moodus	3	0	0	n.a.	3	n.a.
21.	South Norwalk	3	2	1	1	2	1
22.	West Haven	3	1	0	0	3	1
23.	Chester	2	1	1	1	1	0
24.	Cos Cob	2	2	3	3	0	0
25.	East Haddam	2	0	4	n.a.	1	n.a.
25.	Essex	2	1	7	1	0	0
27.	Noank	2	1	9	0	1	1
28.	Rowayton	2	1	4	4	1	0
29.	Fairfield	2	0	4	n.a.	1	n.a.
30.	Lyme	2	0	0	n.a.	2	n.a.
31.	Niantic	2	0	0	n.a.	2	n.a.
32.	Salisbury	2	0	0	n.a.	2	n.a.
33.	Stamford	2	0	6	n.a.	1	n.a.
34.	Stratford	2	0	7	n.a.	1	n.a.
35.	Torrington	2	0	1	n.a.	1	n.a.
36.	Waterford	2	0	5	n.a.	0	n.a.

*Includes two objections to nondredging aspects of the permit application.

TABLE 4-1 - Continued

No.	Port/City/Town	Total No. of Permits	No. of Dredging Permits	Total No. of Objections	Total No. of Dredging Objections	No. of Permits With no Objections	No. of Dredging Permits With no Objections
37.	Shelton	1	1	2	2	0	0
38.	Avon	1	0	5	n.a.	0	n.a.
39.	Bristol	1	0	0	n.a.	0	n.a.
40.	Colchester	1	0	1	n.a.	0	n.a.
41.	East Hampton	1	0	2	n.a.	1	n.a.
42.	East Haven	1	0	0	n.a.	1	n.a.
43.	East Windsor	1	0	0	n.a.	1	n.a.
44.	Granby	1	0	0	n.a.	1	n.a.
45.	Guilford	1	0	0	n.a.	1	n.a.
46.	Hartford	1	0	0	n.a.	1	n.a.
47.	Killingly	1	0	6	n.a.	0	n.a.
48.	Manchester-Vernon	1	0	8	n.a.	0	n.a.
49.	Montville	1	0	0	n.a.	1	n.a.
50.	Naugatuck	1	0	0	n.a.	1	n.a.
51.	North Haven	1	0	5	n.a.	0	n.a.
52.	Saugatuck Shores	1	0	0	n.a.	1	n.a.
53.	Stony Creek	1	0	0	n.a.	1	n.a.
54.	Suffield	1	0	0	n.a.	1	n.a.
55.	Thomaston	1	0	0	n.a.	1	n.a.
56.	Waterbury	1	0	0	n.a.	1	n.a.
57.	Wethersfield	1	0	0	n.a.	1	n.a.
58.	Wilton	1	0	0	n.a.	1	n.a.
	Total	187	49	246	30*	117	29*
	Percent	100	26	100	12*	63	59*

*Does not include two objections to nondredging aspects of one Norwalk application.

4.3 Analysis of Permits at 23 Locations Where Dredging/Disposal Was Permitted

Dredging/disposal permits were issued for 23 Connecticut locations in 1979 and 1980. Other projects were also permitted at these locations, such as the construction of marinas, piers, docks, breakwaters, mooring facilities, bulkheads, groins, ramps, retaining walls, jetties submerged pipes and cables, etc. Table 4-2 presents a more detailed analysis, by location and permit type, of 123 permits issued at the 23 sites. This tables shows that 78 of these permits for all types of projects received objections from the public or from federal, state and location agencies (63 %).

At fourteen locations, one or more of the permitted dredging/disposal projects received at least one formal objection. At the remaining nine locations, there were no objections to dredging/disposal. (Eight of these locations had only one permitted dredging/disposal project; the remaining one had two.) However, at these nine sites, 8 out of 35 other projects received 46 objections. Thus, it cannot be said that at locations involving only occasional dredging permits that lack of objection is indicative of agency or public unawareness or apathy, concerning proposed projects.

At locations where there were objections to some or all of the dredging permit applications, 21 of the permits received 32 objections--15 from agencies and 17 from the public. However, one permit involved two actions and the single agency objection and the single general public objection applied to the nondredging action (the building of a bulkhead out into the river). Therefore, 20 of the permits received 30 objections to dredging/disposal action--14 from agencies and 16 from the public. The other 18 dredging applications at these 14 sites received no objections. Thus, at all 23 locations 20 dredging/disposal actions (41 %) were objected to, but 29 (59 %) were not. Furthermore, there were only 30 objections to dredging/ disposal permits, or 18 percent of the 170 objections received by 26 out of the 78 permit applications (total) granted at these 23 locations. In addition, of the 20 dredging/disposal permits applications receiving objections, 12 received objections only from the public, seven were objected to only by agencies, and one received objections from both agencies and the public.

To illustrate some of these numbers in a more comprehensive form, Figure 4-1 shows a Venn diagram of the set of all Connecticut permits (187); and the subset of permits (123) that occurred at the 23 locations where dredging/disposal took place; the subset of dredging permits in this group (49); the further subsets of dredging permit applications that received no objections to the dredging/disposal action (27) and those that were objected to (20); and the sources of objections for that latter subset.

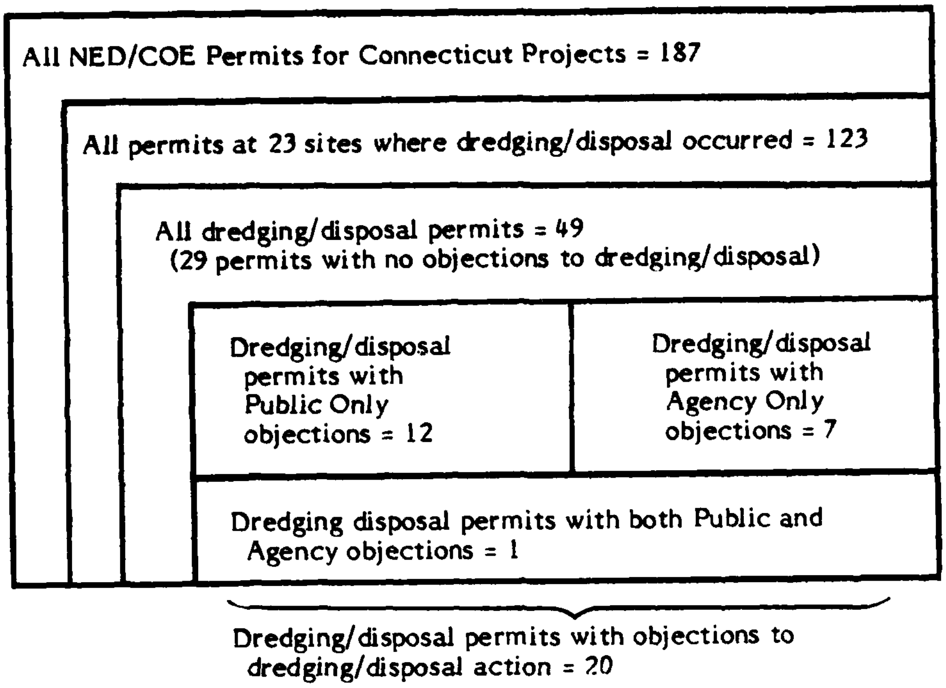

Figure 4-1. Venn diagram of NED/CE permits in Connecticut in 1979 and 1980.

Finally, it should be noted from Table 4-2 that at the 23 locations where dredging/disposal permits were issued, there were a total of 27 agency objections and 143 public objections to 21 dredging and 24 other permit applications, out of a total of 123 permits issued. Among the 27 agency objections 15 (56 %) applied to dredging. However, only 17 (12 %) of the 143 public objections were directed to dredging.

TABLE 4-2

CHARACTERISTICS OF ALL TYPES OF PERMITS ISSUED FOR CONNECTICUT PROJECTS AT SITES WHERE DREDGING WAS PERMITTED IN 1979 AND 1980

Site	Status of Objections	Type of Permit	No. of Permits	No. of Permits With No Objections	No. of Permits With Objections	Number of Objections		
						Agency	Public	Total
Clinton	One or More Objections	Dredging Marina	6 2	2 0	4 2	3 0	2 7	5 7
	No Objections	Pier/Dock	2	2	0			
		Totals	10	4	6	3	9	12
Groton	One or More Objections	Dredging Submerged Line Fill	6 2 1	4 1 0	2 1 1	1 4 3	1 24 0	2 28 3
	No Objections	Pier/Dock Riprap Breakwater Mooring	2 1 1 1	2 1 1 1	0 0 0 0			
		Totals	14	10	4	8	25	33
Darien	One or More Objections	Dredging Jetty Fill	4 1 1	3 0 0	1 1 1	1 0 0	0 1 1	1 1 1
	No Objections	Breakwater	1	1	0			
		Totals	7	4	3	1	2	3
East Norwalk	One or More Objections	Dredging	4	2	2	0	2	2
		Totals	4	2	2	0	2	2
Milford	One or More Objections	Dredging Pier/Dock Ramp Retaining Wall	4 4 1 1	3 3 0 1	1 1 1 0	0 0 0 0	1 2 1 1	1 2 1 1
	No Objections	Fill Groin Bulkhead	1 1 1	1 1 1	0 0 0			
		Totals	13	10	3	0	5	5
Norwalk	One or More Objections	Dredging Fill Riprap Submerged Line	3 2 1 1	1 1 0 0	2 * 1 1 1	1* 0 1 0	2* 27 0 6	3* 27 1 6
	No Objections	Marina Outfall	1 1	1 1	0 0			
		Totals	9	4	5	2	35	37
Westbrook	One or More Objections	Dredging Groin	3 2	2 0	1 2	5 0	0 7	5 7
		Totals	5	2	3	5	7	12
Cos Cob	One or More Objections	Dredging	2	0	2	2	1	3
		Totals	2	0	2	2	1	3

*One permit application had one agency and one public objection to nondredging aspects.

TABLE 4-2 - Continued

Site	Status of Objections	Type of Permit	No. of Permits	No. of Permits With No Objections	No. of Permits With Objections	Number of Objections		
						Agency	Public	Total
South Norwalk	One or More Objections	Dredging Submerged Line	2 1	1 1	1 0	0	1	1
		Totals	3	2	1	0	1	1
Branford	One or More Objections	Dredging Submerged Line	1 2	0 1	1 1	0 1	1 0	1 1
	No Objections	Outfall	1	1	0			
		Totals	4	2	2	1	1	2
Chester	One or More Objections	Dredging	1	0	1	0	1	1
	No Objections	Navigation Markers	1	1	0			
		Totals	2	1	1	0	1	1
Essex	One or More Objections	Dredging Fill	1 1	0 0	1 1	0 0	1 6	1 6
		Totals	2	0	2	0	7	7
Rowayton	One or More Objections	Dredging	1	0	1	0	4	4
	No Objections	Bulkhead	1	1	0			
		Totals	2	1	1	0	4	4
Shelton	One or More Objections	Dredging	1	0	1	2	0	2
		Totals	1	0	1	2	0	2
Subtotal for Sites where Dredging Projects Received Objections		Dredging	39	18	21*	15*	17*	32*
		Other	39	24	15	9	83	92
		All	78	42	36	24	100	124

*Includes one agency and one public objection to nondredging aspects of one Norwalk permit application.

TABLE 4-2 - Concluded

Site	Status of Objections	Type of Permit	No. of Permits	No. of Permits With No Objections	No. of Permits With Objections	Number of Objections		
						Agency	Public	Total
DREDGING PERMITS ISSUED WITHOUT OBJECTIONS AT FOLLOWING SITES								
New Haven	One or More Objections	Riprap	2	1	1	0	1	1
	No Objections	Dredging Pier/Dock Outfall Ramp Marina	2 1 1 1 1	2 1 1 1 1	0 0 0 0 0			
		Totals	8	7	1	0	1	1
Greenwich	One or More Objections	Pier/Dock	1	0	1	0	4	4
	No Objections	Dredging Riprap	1 1	1 1	0 0			
		Totals	3	2	1	0	4	4
Haddam	No Objections	Dredging Retaining Wall Fill	1 1 1	1 1 1	0 0 0			
		Totals	3	3	0			
New London	One or More Objections	Pier/Dock Marina	2 2	0 1	2 1	1 1	1 1	2 2
	No Objections	Dredging Submerged Line Piles	1 1 1	1 1 1	0 0 0			
		Totals	7	4	3	2	2	4
Noank	One or More Objections	Breakwater	1	0	1	0	9	9
	No Objections	Dredging	1	1	0			
		Totals	2	1	1	0	9	9
Old Saybrook	One or More Objections	Groin	1	0	1	0	1	1
	No Objections	Dredging Pier/Dock Retaining Wall Submerged Line Jetty	1 4 1 1 1	1 4 1 1 1	0 0 0 0 0			
		Totals	9	8	1	0	1	1
Riverside	One or More Objections	Pier/Dock	2	1	1	0	22	22
	No Objections	Dredging Retaining Wall Riprap	1 1 1	1 1 1	0 0 0			
		Totals	5	4	1	0	22	22
West Haven	No Objections	Dredging Riprap Revetment	1 1 3	1 1 3	0 0 0			
		Totals	3	3	0			
Westport	One or More Objections	Ramp	1	0	1	1	4	5
	No Objections	Dredging Pier/Dock	1 3	1 3	0 0			
		Totals	5	4	1	1	4	5
		GRAND TOTAL	123	78	45	27	143	170

4.4 Analysis of 49 Dredging/Disposal Permits

Table 4-3 shows certain characteristics of each of the 49 NED/CE dredging permits issued for Connecticut locations in 1979 and 1980, with emphasis on locations, amounts of dredged material to be removed and disposed of, and the source and number of objections. As the table clearly indicates, almost ten times as much dredging occurred (2.148 million cu yd) under the 28 permits which received no objections, as occurred under the 21 permit applications that were objected to (0.265 million cu yd). However, 1.8 million cu yd of the larger figure came from one permit in Groton, involving New London Harbor.

In general, it is noted that one permit (No. 28, ID 494) for removing 2500 cu yd from Westbrook Harbor received five objections from agencies, and another permit (No. 37, ID 224) received four objections from the public. Other than that, 19 permit applications received one or two formal objections, and 28 received none. This is in contrast with some nondredging permits, such as one for a submerged line in the Groton area which received 24 public and four agency objections (see Table 4-2).

Some conclusions that can be drawn from Table 4-3 are as follows:

- The majority of recent Connecticut dredging/disposal permit applications did not receive formal objections.
- Most of the permit applications receiving objections received only one or two.
- Objections are apt to come from agencies or the general public with almost equal probability.
- Amount of material to be dredged seems to have little relationship to whether a dredging permit application will receive objections or not. Some (but not all) large dredging projects received no formal objections, while two small dredging projects received the largest numbe. of objections, one from agencies and the other from the general public.

4.5 Detailed Analysis of Objections, Mitigating Measures, Special Conditions and Significant Environmental and Social Impacts, Associated with 49 Connecticut Dredging/Disposal Permits

Table 4-4 lists the 49 Connecticut dredging/disposal permits by location, following the same sequence of Table 4-3 to allow comparison. The table also includes information on agency and public objections; the mitigating measures the permit applicant incorporated in a revised application in response to the objections or "suggestions;" and special conditions which NED/CE wrote into the permit, either in response to objections, or because the type of dredging routinely includes special conditions. To conserve space, the special conditions have been "coded." Table 4-5 provides the "decode" list, along with an indication of the number of times the special condition appeared and the percent of the 49 dredging/disposal permits that included each special condition.

TABLE 4-3

CHARACTERISTICS OF 49 DREDGING/DISPOSAL PERMITS IN CONNECTICUT IN 1979 AND 1980

No.	CEM ID No.	Town/City/Port	Amount of Dredged Material (cu yd)	Number of Objections		
				Agency	Public	Total
1.	609	Clinton	28,000	1	1	2
2.	274		5,200	1	0	1
3.	288		4,500	1	0	1
4.	083		1,500	0	1	1
5.	055		3,000	0	0	0
6.	443		49,000	0	0	0
		Subtotal	91,200	3	2	5
7.	376	Groton	40,000	0	1	1
8.	550		15,000	1	0	1
9.	171		1,200	0	0	0
10.	173		5,500	0	0	0
11.	210		104,000	0	0	0
12.	215		1,800,000	0	0	0
		Subtotal	1,965,700	1	1	2
13.	056	East Norwalk	12,500	0	1	1
14.	142		3,000	0	1	1
15.	132		2,770	0	0	0
16.	143		2,900	0	0	0
		Subtotal	21,170	0	2	2
17.	416	Darien	250	1	0	1
18.	347		1,000	0	0	0
19.	357		1,150	0	0	0
20.	476		1,150	0	0	0
		Subtotal	3,550	1	0	1
21.	318	Milford	10,000	0	1	1
22.	149		10,000	0	0	0
23.	346		2,445	0	0	0
24.	360		35,000	0	0	0
		Subtotal	57,445	0	1	1
25.	586	Norwalk	1,800	1*	1*	2*
26.	141		2,200	0	1	1
27.	138		1,000	0	0	0
		Subtotal	5,000	0	1	1

*Applies to nondredging aspects of permit.

Table 4-3 - Continued

No.	CEM ID No.	Town/City/Port	Amount of Dredged Material (cu yd)	Number of Objections		
				Agency	Public	Total
28.	494	Westbrook	2,500	5	0	5
29.	004		2,100	0	0	0
30.	071		80	0	0	0
		Subtotal	4,680	5	0	5
31.	181	New Haven	30,000	0	0	0
32.	277		4,500	0	0	0
		Subtotal	34,500			
33.	194	South Norwalk	9,600	0	1	1
34.	146		6,000	0	0	0
		Subtotal	15,600	0	1	1
35.	335	Cos Cob	1,300	2	0	2
36.	714		3,000	0	1	1
		Subtotal	4,300	2	1	3
37.	224	Rowayton	9,500	0	4	4
38.	614	Shelton	105,000	2	0	2
39.	072	Branford	1,000	0	1	1
40.	417	Chester	2,200	0	1	1
41.	109	Essex	6,500	0	1	1
42.	507	Greenwich	2,000	0	0	0
43.	214	Haddam	29,000	0	0	0
44.	404	New London	31,675	0	0	0
45.	391	Noank	200	0	0	0
46.	206	Old Saybrook	3,600	0	0	0
47.	054	West Haven	16,000	0	0	0
48.	483	Westport	2,400	0	0	0
49.	091	Riverside	Unknown,small	0	0	0
		Subtotal	209,075	2	7	9
GRAND TOTAL, 23 SITES			2,412,220	14*	16*	30*

*Does not include objections to nondredging aspects of Norwalk permit application No. 25, CEM ID 586.

TABLE 4-4

OBJECTIONS, MITIGATION MEASURES, AND SPECIAL CONDITIONS FOR 49 DREDGING/DISPOSAL PERMITS IN CONNECTICUT: 1979 AND 1980

No.	CEM ID No.	Objections: Agency	Objections: General Public	Mitigation Measures	Special Conditions
		CLINTON			
1.	609*	USFWS: Wetland disturbance. (Applies to dredging)	One: Noise and water pollution. (Applies to dredging)	• Reduce size 50%. • Won't dredge wetland areas. • Will dispose of material upland.	• 1
2.	274	CT DOA/Aquiculture Div.: No work 1 June-30 Sept.	None	None	• 1 • 10 • 8
3.	288	CT DOA/Aquiculture Div.: No work 1 June-30 Sept.	None	None	• 1 • 10 • 8
4.	083	None	One: Possible runoff & odor.	None	• 1 • 20
5.	055	None	None	None	• 1 • 9 • 8
6.	443	None	None	None	• 8 • 11 • 9
		GROTON			
7.	376	None	One: Object to open water disposal; prefer upland disposal.	None	• 1 • 11 • 8 • 12
8.	550*	Groton Conser.Comm.: Wanted overall long range plan for Thames River.	None	None	• 1 • 12 • 8 • 13 • 14
9.	171	None	None	None	• 2 • 11
10.	173	None	None	None	• 2 • 11
11.	210	None	None	None	• 8 • 13 • 9 • 15 • 11 • 17
12.	215	None	None	None	• 8 • 13 • 9 • 21
		EAST NORWALK			
13.	056	None	One: Adverse aesthetic & environmental impacts.	None	• 1 • 11 • 8
14.	142	None	One: Unknown.	None	• 8 • 15 • 9 • 18 • 11 • 22 • 13
15.	132	None	None	None	• 8 • 15 • 11 • 17
16.	143	None	None	None	• 8 • 15 • 11 • 18 • 13

*Permit not included in the analyses presented in Section 4 of CEM Report 4280-06-732, *General Permit Study for the Six New England States*, because the project involved dredging and one other action. (See Appendix C.)

Table 4-4 - Continued

No.	CEM ID No.	Objections: Agency	Objections: General Public	Mitigation Measures	Special Conditions
			DARIEN		
17.	416	<u>Five Mile River Comm.</u>: Dredging should not extend more than 5-7 ft below MLW.	None	None	• 8 • 9 • 11 • 17
18.	347	None	None	• Dredging depth reduced from 8 ft to 6 ft below MLW.	• 1
19.	357	None	None	None	• 1 • 11 • 8
20.	476	None	None	None	• 1 • 11 • 8
			MILFORD		
21.	318	None	<u>One</u>: Object to open water disposal; prefer upland disposal.	None	• 1 • 8 • 11
22.	149	None	None	None	• 3 • 23
23.	346	None	None	None	• 7 • 24
24.	360	None	None	None	• 1 • 9
			NORWALK		
25.	588*	<u>Planning & Zoning Comm.</u>: Excessive encroachment on river by bulkhead (does not apply to dredging)	<u>One</u>: Excessive encroachment on river by bulkhead. (does not apply to dredging)	• Encroachment on river by bulkhead was minimized.	• 1 • 11
26.	141	None	<u>One</u>: Object to open water disposal; prefer upland disposal.	None	• 1 • 13 • 8 • 15 • 11 • 18
27.	138*	None	None	• Proposed disposal site changed. • COE will monitor disposal.	• 8 • 13 • 9 • 19 • 11 • 25
			WESTBROOK		
28.	494	<u>U.S.FWS, CT DOA/Aquaculture Div., Westbrook Planning Comm., Westbrook Conservation Comm., Westbrook Harbor Comm.</u>: Disposal on tidal wetland.	None	• Disposal site relocated to avoid tidal wetland.	• 1 • 19 • 26
29.	004	None	None	None	• 1 • 20
30.	071	None	None	None	• 11
			NEW HAVEN		
31.	181	None	None	None	• 8 • 13 • 9 • 27 • 11
32.	277	None	None	None	• 1 • 17 • 8

*Permit not included in the analyses presented in Section 4 of CEM Report 4280-06-732, *General Permit Study for the Six New England States*, because the project involved dredging and one other action. (See Appendix C.)

Table 4-4 - Continued

No.	CEM ID No.	Objections: Agency	Objections: General Public	Mitigation Measures	Special Conditions
SOUTH NORWALK					
33.	194	None	One: 10-year O&M dredging is too long.	None	• 8 • 16 • 11 • 18 • 13
34	146	None	None	None	• 8 • 15 • 11 • 17 • 13 • 18
COS COB					
35.	335	U.S.FWS, NMFS: No dredging in intertidal marsh.	None	• Will not dredge in intertidal marsh.	• 11
36.	714*	None	One: • Dredging will cause siltation of basin. • Bulkhead aesthetically displeasing.	None	• 1 • 11
ROWAYTON					
37.	224	None	Four: • Object to open water disposal. • East boundary of area unclear.	• Redefine east boundary of channel.	• 8 • 9 • 11 • 13
SHELTON					
38.	614*	Fairfield Co. Soil & Water Conservation Dist.: Want EIS. CT DOA/Aquaculture Div.: Salinity of water may change. (Both applicable to dredging)	None	None	• 29 • 30 • 31 • 32
BRANFORD					
39.	072	None	One: Object to open water disposal.	None	• 1 • 9 • 8 • 13
CHESTER					
40.	417	None	One: Runoff will encroach on neighbor's land.	• Disposal area will be graded away from neighbor's land. • Size of disposal area reduced to protect cattail wetland.	• 4 • 11 • 17
ESSEX					
41.	109	None	One: Object to open water disposal.	• Disposal on land, instead of LIS.	• 11
GREENWICH					
42.	507	None	None	None	None
HADDAM					
43.	214	None	None	None	• 5 • 11

*Permit not included in the analyses presented in Section 4 of CEM Report 4280-06-732, *General Permit Study for the Six New England States*, because the project involved dredging and one other action. (See Appendix C.)

Table 4-4 - Concluded

No.	CEM ID No.	Objections		Mitigation Measures	Special Conditions
		Agency	General Public		
NEW LONDON					
44.	404	None	None	None	• 11 • 33 • 22 • 34
NOANK					
45.	391	None	None	None	• 1 • 17
OLD SAYBROOK					
46.	206	None	None	None	• 6 • 11
WEST HAVEN					
47.	054	None	None	None	• 1
WESTPORT					
48.	483	None	None	• Will install interior baffles in disposal area to retard flow. • Increase dike height.	• 1 • 35
RIVERSIDE					
49.	091*	None	None	None	None

*Permit not included in the analyses presented in Section 4 of CEM Report 4280-06-732, *General Permit Study for the Six New England States*, because the project involved dredging and one other action. (See Appendix C.)

TABLE 4-5

DESCRIPTION AND FREQUENCY OF SPECIAL CONDITIONS IMPOSED BY NED/COE ON DREDGING/DISPOSAL PERMITS IN CONNECTICUT: 1979 AND 1980

Special Condition Number (Table 4-4)	Description of Special Condition	Number of Times the Special Condition Occurred	Percent of Permits Including The Special Condition
1	No dredging 1 June - 30 Sept.	23	47
2	No dredging 15 June - 30 Sept.	2	4
3	No dredging after 15 June	1	2
4	No dredging 1 June - 1 Sept.	1	2
5	No dredging 1 April - 15 June	1	2
6	No dredging 1 April - 30 Sept.	1	2
7	Dredging limited to 1 March - 1 May.	1	2
8	Dump only at buoy set at disposal site.	24	49
9	Dredging and disposal to be monitored by government personnel.	11	22
10	Disposal to be monitored by government personnel.	2	2
11	10-yr maintenance dredging permit; 90-day written notice required.	28	57
12	Permit may be suspended/modified, if need to change manner of dredging.	2	4
13	Activities must meet 1970 OSHA conditions.	12	24
14	Disposed material to be capped with cleaner material (Class I and/or Class II).	1	2
15	Disposed material to be capped with cleaner material (Class I and/or Class II) prior to 1 Dec. 1980.	5	10
16	Disposed material to be capped with cleaner material (Class I and/or Class II) prior to 1 Jan.1981.	1	2
17	Permit not valid without state license.	6	12
18	Scows enroute to/from CLISRDA must enter and leave harbor through Federal navigation channel.	5	10
19	Upland disposal area must be diked to prevent runoff.	2	4
20	Must prevent runoff from entering waterway.	2	4
21	Permit may be suspended if monitoring reveals need to change disposal area or technique.	1	2
22	Northern edge of marina basin will be sloped to stabilize adjacent shoreline.	2	4
23	Emergency permit.	1	2
24	Sand not to be removed below MLW line.	1	2
25	Dredging coordinated with Federal dredging of "hot spots."	1	2
26	Use mats to protect adjacent wetland area.	1	2
27	Use only clamshell dredging eouipment.	1	2
28	No reintroduction of dredged material into river.	1	2
29	Monitoring required for suspended solids, and physical and chemical characteristics.	1	2
30	Continued documentation of depth soundings.	1	2
31	No dredging shoreward of MLW, to protect shallow water areas near shore.	1	2
32	Disposal of waste products in accordance with Connecticut requirements.	1	2
33	Stop work if archeological, scientific, prehistorical, or historical artifacts found.	1	2
34	Work to be done prior to U.S. Navy dredging.	1	2
35	Work to stop, if effluent through weir exceeds state water quality standard.	1	2
Total		146	

Agency Objections

Table 4-6 lists the 10 agencies that lodged 14 formal objections to 9 permits. The Aquaculture Division of the Connecticut Department of Agriculture made objections--to five dredging/disposal permit applications--the most by any agency. The U.S. Fish and Wildlife Service objected to these permit applications. The other eight agencies each made one objection. Only one of this group was a Federal agency: the National Marine Fisheries Service (NOAA). The remainder were local government agencies. It should be noted that the Environmental Protection Agency and the Connecticut Department of Environmental Protection are conspicuous by their lack of objections. As noted above, these agencies may prefer to make written "suggestions," which the permit applicant may decide to include as mitigating measures in a revised application. Having been effective in accomplishing their goals informally, agencies making "suggestions" have no need to lodge formal objections.*

TABLE 4-6

AGENCY OBJECTIONS TO CONNECTICUT DREDGING/DISPOSAL PROJECTS 1979-1980

No.	Agency	Objection	Frequency of Objection	Included in Permit as Mitigation Measure or Special Condition
1.	U.S. FWS	• Wetland disturbance.	1	Yes
		• Disposal on tidal wetland.	1	Yes
		• No dredging in intertidal marsh.	1	Yes
2.	CT/DOA Aquaculture Division	• No work during 1 June - 30 Sept.	2	Yes, Yes
		• Disposal on tidal wetland.	1	Yes
		• Salinity of water may change, due to project.	1	No
3.	Groton Conservation Commission	• Want overall long-range plan developed for all Thames River activities and projects.	1	No
4.	Five Mile River Commission	• Dredging should not extend more than 5-7 ft below MLW.	1	Yes
	Westbrook:			
5.	Planning Commission	• Disposal on tidal wetland.	1	Yes
6.	Conservation Comm.	• Disposal on tidal wetland.	1	Yes
7.	Harbor Comm.	• Disposal on tidal wetland.	1	Yes
8.	NMFS	• No dredging in intertidal marsh.	1	Yes
9.	Fairfield Co. Soil & Water Conservation District	• Want environmental impact statement prepared.	1	No
	TOTAL		14 *	

*One additional agency objection, by the Norwalk Planning & Zoning Commission, referred to excessive encroachment on the river by a proposed bulkhead. It does not apply to the dredging/disposal part of the permit application.

*Also, the permit applicant already may have received a Connecticut permit. This would obviate any reason for the Connecticut Department of Environmental Protection to raise objections.

One permit application for Westbrook (No. 28; CEM ID 494) received one federal, one Connecticut, and three local agency objectives to disposal on a tidal wetland. The applicant revised the disposal site and the action was permitted with three special conditions. Another permit application for removal of river bottom sand and gravel for commercial use received objections from one Connecticut and one local agency. The permit was issued with four special conditions. All other agency objections were limited to one agency objection per permit. Only three agency objections were not accommodated: two were outside the purview of NED/CE responsibility; the third (change in salinity) referred to a speculative transient natural phenomenon of short duration at most. In general, either the applicant or NED/CE (or both) responded positively to agency objections.

General Public Objections

Table 4-7 lists the 16 formal objections lodged by the general public against 13 permit applications. One application for Rowayton (No. 37; CEM ID 224) received four objections concerning open water disposal and lack of clear definition of one boundary of the dredging area. The revised permit application included a mitigating measure which clarified the boundary, and four special conditions which constrain open water disposal to a marked site and require dredging and disposal monitoring by government personnel. All other general public objections are limited to one per permit. Five of these single objections also concern open water disposal--making this issue the greatest concern to the general public. Objections to runoff from upland disposal sites occur twice. All other objections occur only once; they relate to noise, water pollution, odor, aesthetic and environmental impacts, siltation of a basin, and the 10-year duration of a maintenance dredging permit ("too long"). With the exception of the latter two objections, all were accommodated, either through mitigating measures included in a revised application or through special conditions imposed by NED/CE. In general, either the applicant or NED/CE responded positively to objections by the general public.

Mitigating Measures

Of the 49 permits issued by NED/CE for Connecticut dredging/disposal projects in 1979 and 1980, after initial review by agencies, the general public, and NED/CE, applicants revised 10 permit applications, by including mitigating measures which reponded at least to some of the objections. In four cases, the mitigating measures were included, although no formal objections had been lodged. This probably is indicative of the effectiveness of the informal written "suggestion" method used by

TABLE 4-7

GENERAL PUBLIC OBJECTIONS TO CONNECTICUT DREDGING/DISPOSAL PROJECTS: 1979 AND 1980

No.	Location	Objection	Included in Permit as Mitigation Measure or Special Condition
1.	Clinton	• Noise and water pollution.	Yes
2.	Clinton	• Possible runoff and odor.	Yes
3.	Groton	• Object to open water disposal; prefer upland disposal.	Yes *
4.	E. Norwalk	• Adverse aesthetic and environmental impacts.	Yes
5.	Milford	• Object to open water disposal; prefer upland disposal.	Yes *
6.	Norwalk	• Object to open water disposal; prefer upland disposal.	Yes *
7.	S. Norwalk	• 10-yr permit for maintenance dredging is too long.	No
8.	Cos Cob	• Dredging will cause siltation of basin.	No
9.	Rowayton(4)	• Object to open water disposal. Boundary unclear.	Yes *
10.	Branford	• Object to open water disposal.	Yes *
11.	Chester	• Runoff will encroach on neighbor's land.	Yes
12.	Essex	• Object to open water disposal.	Yes **
	TOTAL		15 ≠

*Special conditions put on open water disposal.

**Disposal on land, instead of open water.

≠One general public objection is unknown. A second applied to the bulkhead part of a proposed project.

some agencies. In one case, the agency and public objections were to nondredging aspects of the permit application. In the remaining five cases, the mitigating measures were due to general public objections only in three instances; to agency objections only in one case; and to both agency and general public objections in the final situation.

In 13 cases where formal objections had been raised by either agencies or the general public, the permit applicant did not revise the application to include mitigating measures. However, in each of those instances, NED/CE imposed two to seven special conditions which were responsive to the objections. (The average number of special conditions was nearly four.)

Special Conditions

Only two of the 49 Connecticut dredging/disposal permits do not include special conditions imposed by NED/CE (see Table 4-4, Nos. 42 and 49). oth involve no more than 12,000 cu yd of dredging, and neither received formal objections. The other 47 permits include from one to seven special conditions (average = 3.1), which all apply to dredging/disposal.

Table 4-5 (the "decode" table accompanying Table 4-4) describes the 35 generic special conditions which NED/CE applied to Connecticut permits, and gives the number of times each generic condition was applied. Special conditions Nos. 23 through 35 are highly project-specific; these 13 each appear only once. Special conditions Nos. 1 through 22 are more general; they were used 133 times. Several of these special conditions can be grouped under a single generic heading, as shown in Table 4-8. Over three-fifths of all 49 permits had a special condition indicating when dredging should not occur, or limiting it to when it could occur. Generally, this special condition called for no dredging during most or all of June through September--in part because it would interfere with shellfish activity and also because those are heavy recreation months. Nearly half of the permits included a requirement that open water disposal should occur at a site marked by a buoy. In over one-fourth of the permits it was required that dredging and/or disposal be monitored by government personnel. Nearly three-fifths of the permits were for maintenance dredging; such permits are valid for 10 years, but require the permittee to inform NED/CE in writing at least 90 days before dredging begins. Other special conditions that were imposed several times include complying with the 1970 Occupational Safety and Health Act; capping contaminated Class III dredged material with cleaner Class I or Class II material; receiving a state dredging license; specifying use of Federal navigation channels; and requiring diking of upland disposal areas to prevent runoff.

TABLE 4-8

SPECIAL CONDITIONS MOST FREQUENTLY APPLIED TO CONNECTICUT DREDGING/DISPOSAL PERMITS

Special Condition Number	Description	Percent of Permits with Special Condition
1,2,3,4,5,6,7	Period designated when no dredging to occur, or period designated when dredging is to occur.	61
8	Dumping at buoy set at disposal site.	49
9,10	Dredging and/or disposal to be monitored by government personnel.	26
11	Maintenance dredging permit issued for 10 years; COE must be notified in writing 90 days before dredging to occur.	57
13	Activities must meet 1970 OSHA conditions.	24
14,15,16	Disposed material to be capped with cleaner Class I or Class II material (before specified date).	14
17	Permit not valid without state license.	12
18	Scows enroute to/from Cental LIS Regional Disposal Area must enter/leave harbor through Federal navigation channel.	10
19	Upland disposal area must be diked to prevent runoff.	8

In 27 of the 49 permits, NED/CE imposed special conditions on dredging/disposal, even though there were no agency or general public objections to the dredging/disposal aspects of the permit application. (As noted above, in only two instances were no special conditions imposed.) It is possible that at least some of these special conditions were in response to informal written "suggestions" provided by reviewing agencies.

The 20 permit applications which gave rise to agency and/or general public objections resulted in permits with 68 special conditions, ranging from one to seven per permit, with an average of 3.4. The other 29 permits, where there were no objections to dredging/disposal actions, contained from zero to six special conditions, with an average of 2.76. Clearly, NED/CE is responsive to agency and general public objections to dredging/disposal permit applications. It is also evident that NED/CE has been careful about controlling critical aspects of dredging disposal, even in the absence of formal objections.

4.6 Dredging/Disposal Permits of Proposed Containment Facility Sites

During 1979 and 1980, there were no dredging permits issued by NED/CE for Black Rock Harbor or Bridgeport Harbor.

In New Haven Harbor, Table 4-3 shows that two permits were issued for New Haven--one for 30,000 cu yd and one for 4,500 cu yd. Neither received objections. Table 4-4 shows that neither permit involved mitigating measures and the larger project was maintenance dredging and had five special conditions, while the smaller project had three. There was one permit issued for dredging 16,000 cu yd at West Haven. There were no objections or mitigating measures, and only one special condition.

Clinton Harbor had six permits, with four of the applications receiving objections. Of these four, the one with the largest amount of material to be removed received objections from both agencies and the general public--the only one of the 49 permits which did. Also, it was the only one of the Clinton permits which incorporated mitigating measures. However, it had only one special condition (no dredging June through September). The other permits had objections from the Connecticut DOA Division of Aquaculture; each permit carried the same three special conditions. Another had one public objection (to runoff and odor); it had two special conditions. The remaining two permits, one for 49,000 cu yd and the other for 3000 cu yd, received no objections, had no mitigating measures, and each carried three special conditions. It is noted that Clinton Harbor projects in 1979 and 1980 received more

formal objections (five: three agency and two general public) than any other location in Connecticut. In part, that may have occurred because they had more permitted projects (six) than any other location, with the exception of Groton.

New London Harbor gave rise to seven dredging permits, six in Groton and one in New London. Only two of the Groton permit applications received objections: one from an agency requesting a long range plan for the Thames River and the other objecting to open water disposal. Neither permit incorporated mitigating measures but one had five special conditions and the other had four. The other four Groton permits, which received no formal objections and involved no mitigating measures, included two large projects--one for 1.8 million cu yd, the longest dredging/disposal project permitted in Connecticut in 1979 and 1980. The New London project, involving a modest 31,675 cu yd, had no objections or mitigating measures, and carried four special conditions.

Prototype dredged material containment facilities have been proposed by NED/CE for three of the largest sources of dredged material along the Connecticut coastline of the Long Island Sound region: two for Bridgeport Harbor; one for New Haven Harbor; and two for New London Harbor. A sixth facility is proposed for Clinton Harbor. A total of 16 of the 49 dredging permits issued by NED/CE for Connecticut locations in 1979 and 1980 directly involve three of these four locations. (There were no dredging/disposal permits issued in the Bridgeport/Black Rock Harbor region in this period.) Of these 16 permits, six received formal objections and 10 had none. The 10 permits with no objections accounted for 2,024,000 cu yd of dredged material--nearly 84 percent of all the permitted dredging in Connecticut in 1979 and 1980.

Only one of these 16 permits included mitigating measures stemming from either formal or informal objections. However all of them carried special conditions imposed by NED/CE, as did all but two of all 49 permits.

4.7 Significant Environmental and Societal Impacts

As part of the permitting process for projects of all kinds in navigable waters, NED/CE performs qualitative assessment of significant environmental and social impacts. Adverse impacts are indicated by a "-" and beneficial impacts are noted by a "+" in appropriate blanks in a form that is part of the permit application file. While the attributes considered are 20 in number (including the category "Other"), only 10 attributes were invoked in the 49 Connecticut permits. Table 4-9 lists the 49 permits, their locations and their short-term and long-term adverse and beneficial impacts, as

TABLE 4-9

SIGNIFICANT ENVIRONMENTAL AND SOCIAL IMPACTS FOR 49 DREDGING/DISPOSAL PERMITS IN CONNECTICUT: 1979 AND 1980

No.	CEM ID No.	Port/ Town/ City	Significant Environmental and Social Impacts: Short-Term Adverse	Short-Term Beneficial	Long-Term Adverse	Long-Term Beneficial	Amount of Dredged Material (cu yd)
1.	609	Clinton	1	-	-	-	28,000
2.	274		-	-	-	-	5,200
3.	288		-	-	-	-	4,500
4.	083		-	-	-	-	1,500
5.	055		-	-	-	-	3,000
6.	443		1,3	-	-	-	49,000
7.	376	Groton	-	-	-	-	40,000
8.	550		1	-	-	-	15,000
9.	171		1,2,3,5	-	-	7	1,200
10.	173		1,2,3,5	-	-	7	5,500
11.	210		1,4	-	-	-	104,000
12.	215		Information is not available in permit file.*				1,800,000
13.	056	E. Norwalk	1,3	-	-	6,7	12,500
14.	142		Information is not available in permit file.*				3,000
15.	132		Information is not available in permit file.*				2,770
16.	143		Information is not available in permit file.*				2,900
17.	416	Darien	1	-	-	-	250
18.	347		1	-	-	-	1,000
19.	357		1	-	-	-	1,150
20.	476		1	-	-	-	1,150
21.	318	Milford	-	-	-	-	10,000
22.	149		-	-	-	8	10,000
23.	346		3	-	-	-	2,445
24.	360		-	-	-	-	35,000
25.	586	Norwalk	-	-	-	-	1,800
26.	141		Information is not available in permit file.*				2,200
27.	138		Information is not available in permit file.*				1,000
28.	494	Westbrook	-	-	-	-	2,500
29.	004		1	-	-	-	2,100
30.	071		-	-	-	-	80
31.	181	New Haven	1	-	-	9	30,000
32.	277		1	-	-	-	4,500
33.	194	S. Norwalk	1,3	-	-	6	9,600
34.	146		-	-	-	-	6,000
35.	335	Cos Cob	1	-	-	-	1,300
36.	714		1	-	-	-	3,000
37.	324	Rowayton	-	-	-	-	9,500
38.	614	Shelton	1	-	3	4,7,10	105,000
39.	072	Branford	1	-	-	-	1,000
40.	417	Chester	1,2,5	-	-	6	2,200
41.	109	Essex	1,2,3,5	-	-	7	6,500
42.	507	Greenwich	1,3	-	-	6,7	2,000
43.	214	Haddam	1,2,3,5	-	-	9,10	29,000
44.	404	New London	1,4	-	-	-	31,675
45.	391	Noank	1,2,5	-	-	7	200
46.	206	Old Saybrook	1,2,3,5	-	-	7	3,600
47.	054	W. Haven	-	-	-	-	16,000
48.	483	Westport	1	-	-	-	2,400
49.	091	Riverside	-	-	-	-	Unknown, small

Legend: 1. Water Quality 2. Air Quality 3. Benthic Species 4. Finfish/Plankton 5. Noise 6. Navigation 7. Recreation 8. Safety 9. Energy Needs 10. Economics

*Narrative part of permit states: "Possible cumulative effects: none are foreseen."

judged by NED/CE. Of the 49 permits, 15 indicate no significant impacts and six have no impact evaluation sheet in the file. (However, the narrative part of the permit addresses impacts by stating: "Possible cumulative effects: none are foreseen.") The remaining 28 permits are estimated to have short-term adverse impacts for one to four attributes. Thirteen of this group of projects were judged by NED/CE to have one to three long-term beneficial impacts. Only one of the projects (in Shelton) was judged to have a long-term adverse impact--on benthic species. However, that was counterbalanced by a long-term beneficial impact on finfish/plankton. None of the projects was judged to have a short-term beneficial impact.

Table 4-10 shows the frequency of significant short-term and long-term adverse and beneficial impacts. Clearly short-term adverse impacts on water quality and benthic (bottom) species predominate, as might be expected. Other short-term adverse impacts occur to air quality and a significant short-term adverse impact on finfish/plankton would occur. Only in the Shelton permit, which involved 105,000 cu yd of dredging, was it judged that there would be a long-term adverse impact on benthic species, with an accompanying long-term benefical impact on finfish/plankton. Recreation was the most prevalently-judged long-term beneficial impact, with navigation, economics, energy needs and safety following in that order.

TABLE 4-10

FREQUENCY OF OCCURRENCE OF ENVIRONMENTAL AND SOCIAL IMPACT ATTRIBUTES FOR 28 DREDGING/DISPOSAL PERMITS IN CONNECTICUT: 1979 AND 1980

Impact Attribute	Frequency of Occurrence			
	Short-Term		Long-Term	
	Adverse	Beneficial	Adverse	Beneficial
1. Water Quality	27			
2. Air Quality	7			
3. Benthic Species	11		1	
4. Finfish/Plankton	2			1
5. Noise	7			
6. Navigation				4
7. Recreation				8
8. Safety				1
9. Energy Needs				2
10. Economics				2
TOTAL	54	0	1	18

Project size seems to have little bearing on the question of whether adverse or beneficial impacts were assigned. Adverse impacts were judged to occur for projects ranging from 200 to 105,000 cu yd and were assigned to nine projects of 10,000 cu yd or more and 19 projects under 10,000 cu yd. Beneficial impacts were noted for projects also ranging from 200 to 105,000 cu yd; they were assigned to five projects of 10,000 cu yd or more and eight projects under 10,000 cu yd. It is surprising that ten other projects of 10,000 cu yd or more were assigned no beneficial impacts.

4.8 Summary

This analysis has produced the following results:

- There were 187 NED/CE permits issued for activities at 55 locations in Connecticut in 1979 and 1980.
- There were 246 formal objections to aspects of 123 of the permit applications, i.e., about two-thirds received objections.
- Only 49 (two-fifths) of all applications were for dredging/disposal.
- There were 30 formal objections to aspects of 20 (about two-fifths) of the dredging/disposal permit applications.
- Compared to all permit applications, dredging/disposal applications had fewer applications which received objections, and the rate of objections was lower. This implies that dredging/disposal applications may be more carefully and thoughtfully prepared than other types of applications.
- Dredging/disposal applications received approximately equal numbers of objections from agencies and the general public.
- Usually the objections to a dredging/disposal permit were either all from agencies, or all from the general public.
- For three-fourths of the dredging/disposal applications receiving objections, there was only one objection. Only two applications received more than two objections.
- The 14 agency objections were as follows:

Objection	No. of Objections
1. Disposal on tidal wetlands	5
2. Dredging of intertidal marsh	3
3. Dredging during June through September	2
4. Dredging too deep	1
5. Possible salinity change due to dredging	1
6. Want EIS prior to dredging	1
7. Want long-range region plan prepared	1

o The 16 general public objections were:

Objection	No. of Objections
1. Open water disposal	6
2. Preference for upland disposal	3
3. Noise and water pollution	1
4. Possible runoff and odor	1
5. Adverse environmental/aesthetic impacts	1
6. Lack of boundary clarity	1
7. Runoff onto neighbor's land	1
8. Ten-year dredging permit too long	1
9. Dredging would cause basin siltation	1

o Mitigating measures were included in revised permit applications in ten cases. In four of the cases, mitigating measures were introduced although no formal objections had been made. This implies there is an informal process of interaction between applicants, NED/CE and/or other agencies which effectively adds to the formal objection process.

o All but two of the 49 Connecticut dredging/disposal permits issued by NED/CE in 1979 and 1980 contained special conditions imposed by NED/CE.

o The five special conditions imposed most frequently were:

Special Condition	Percent of Permits with the Special Condition
1. Period designated when no dredging to occur, or period designated when dredging to occur.	61
2. Maintenance dredging permit issued for 10 years. NED/CE to be notified in writing 90 days before dredging to occur.	57
3. Dumping to be done at buoy set at open water disposal site.	49
4. Dredging and/or disposal to be monitored by government personnel.	26
5. Activities and/or disposal to be monitored by government personnel	24

o Objections to permit applications at potential DMCF sites were as follows:

- New Haven Harbor (and West Haven): Three permit applications, no objections.
- Clinton Harbor: Six permit applications; four received objections. Clinton Harbor projects received more total objections than any other location in Connecticut. The objections were disturbance of wetlands; dredging during summer months; noise and water pollution; possible run-off from upland disposal and odor.
- New London Harbor: Seven permit applications; two received objections. One objector wanted a long-range regional plan prepared before dredging; and the other objected to open water disposal.
- Bridgeport Harbor and Black Rock Harbor: No permit applications filed.

The above results were used in this study as a background for developing the final scenarios for the construction and filling of DMCFs at each potential site. By identifying the significant objections that had been made and the mitigating measures and special conditions that had been included in issued dredging permits, we were able to specify in the scenario how work should best be scheduled and accomplished, thus avoiding the potential for many major impacts. Furthermore, we were able to select impact attributes to be considered in the analysis, which were known to be important.

5.0 SITE ANALYSIS #1: FAYERWEATHER ISLAND/BLACK ROCK HARBOR

5.1 Introduction

This section presents the detailed results of the analysis of social and economic impacts associated with the construction and final use of a prototype dredged material containment facility at Fayerweather Island, between Black Rock Harbor and Bridgeport Harbor. Short-term impacts during construction of dikes, filling with dredged material, dewatering and final capping contouring, and planting have been examined, as well as long-term impacts involving final use. The material in this section is meant to be self-sufficient so it can be separated and directly used as background information to be made available to citizens in the region prior to or at public meetings.

The background material essential for assessing impacts is summarized in Section 5.2. A scenario for the construction, filling, completion and use of the containment facility is given in Section 5.3. The short-term and long-term socioeconomic impacts are presented and evaluated in Section 5.4. The cost analysis is given in Section 5.5 and a summary of the most pertinent results is given in Section 5.6.

It should be recognized that the prototype containment facility at Fayerweather Island in Black Rock Harbor and the facility at Yellow Mill Channel in Bridgeport Harbor have been studied separately. If both prototype facilities were built, one would anticipate that a coordinated and probably time-phased sequence of construction and filling of each facility would occur.

5.2 Background

Bridgeport is located about 50 miles northeast of New York City and about 19 miles southwest of New Haven, Connecticut. The city of Bridgeport occupies 17.5 square miles. In 1980, approximately 142,500 persons resided in the city. The population decreased by 8.9 percent between 1970 and 1980. However, it is still ranked as Connecticut's most populous city. The population density is 8,412 persons per square mile (1,2).*

In 1980, 55,291 housing units could be found in the city and total housing units increased 1.1 percent between 1970 and 1980 (2). Access to Bridgeport is by way of highways such as Route I-95, Route 1, Route 8 and other smaller secondary roads; railroad; boat; and ferryport. There is also an airport in the city. About 69,995 taxable motor vehicles were assessed in the city in 1977 (3). The tax rate in Bridgeport was 64.9 mills for the year 1978-1979 with a next taxable grand list of $893,128,873. The mean per capita income was $4,547 in 1975. This is about $1,000 below the state average (3).

*Numbers refer to references at the end of this section.

Important basic industries in the area include manufacturing, trade and port-related activities. Major manufacturing, much of which is defense industry-related includes: firearms, brass goods, aluminum and zinc castings and valves, electronic appliances, wiring devices, aircraft and plastics.

In the city of Bridgeport, land use is as follows:

Type	Acres	Percent of Total
Residential	5,642	54.4
Commercial/Industrial	2,677	25.8
Other	1,606	15.8
Unused	441	4.0

Bridgeport Harbor and Black Rock Harbor handled about 3.5 million tons (one-sixth) of Connecticut's waterborne commerce in 1977. Of this total, 80 percent, or 2.8 million tons, was petroleum products. Electric utilities in Bridgeport consumed about one-fourth of all petroleum products entering the port. Sand, crushed rock and scrap are nonpetroleum products passing through the ports.

A total of eight piers, wharves and docks are located in the Cedar Creek extension of Black Rock Harbor. The description of waterfront facilities is as follows: One facility is used for the shipment of scrap metal; three are used for the receipt of petroleum products; one facility owned by Sikorsky Aircraft is used for the occasional receipt of helicopters to be repaired; and three were not being used at the time of the survey.

Five marinas, yacht clubs and boat yards are located on the mainland shore of Black Rock Harbor, Burr Creek and Cedar Creek. Over 1000 slips are available with a reported area of 11 acres for the entire city. It is estimated that more than half of these slips are in Black Rock Harbor. Both powerboats and sailboats are accommodated in the marinas with the emphasis on powerboats of most sizes.

Approximately 5200 persons live within a one mile radius of the proposed Fayerweather Island containment facility. The zoning map, Figure 5-1, shows residential and park lands adjacent to the middle harbor and industrial lands further inland. A large number of people also work in the area. Fayerweather Island is adjacent to the city's sanitary landfill and in close proximity to Seaside Park, which is one of the best, well-kept and most utilized parks in the city. Both are located on the eastern shore of Black Rock Harbor. Across the harbor on the western shore, there are numerous residential housing units. The area is zoned primarily residential and includes extensive homes, as well as several apartment and condominium complexes and the Black Rock Yacht Club.

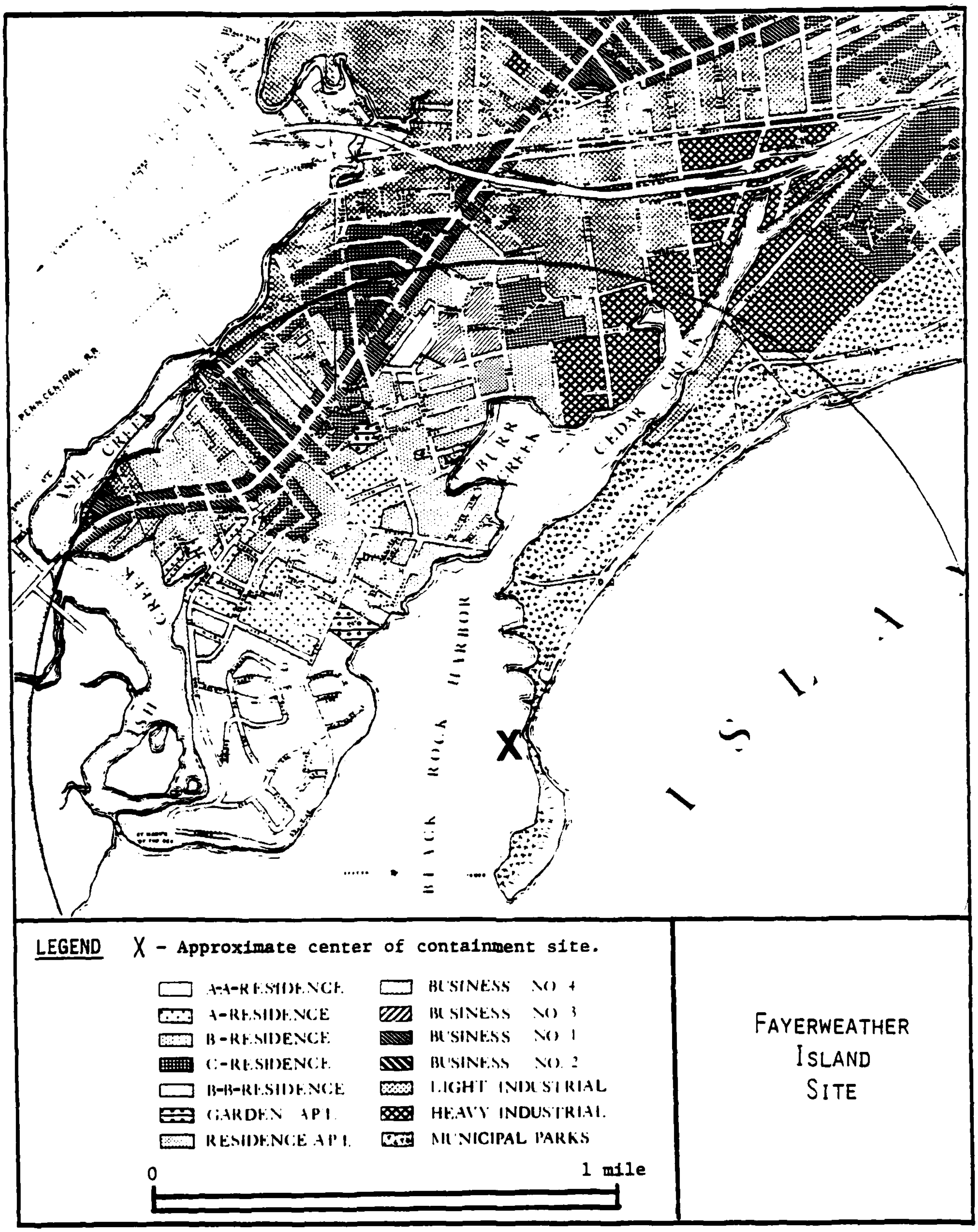

Figure 5-1. Zoning map for Fayerweather Island site.

The Black Rock Yacht Club, Fayerweather Yacht Club, Fayerweather Boat Yard, Burr Creek Marina, Cedar Boat Way and Port 5 Veterans Association are situated on the northern shore of Black Rock Harbor at Cedar Creek. The City of Bridgeport operates a wastewater treatment plant which discharges into Cedar Creek. Although not operational at present, the Connecticut Resource Recovery Plant is located close by. Sikorsky Aircraft also maintains a docking facility on the upper reach of Cedar Creek. A large, low-income housing complex is located in the area. A lighthouse at the south end may have some historical significance. In general, a large volume of boat traffic uses Black Rock Harbor and numerous offshore moorings are located within the harbor. These provide anchorage primarily for sailing vessels.

5.3 Fayerweather Island Scenario

The objective of the Fayerweather Island/Black Rock Harbor containment facility is to provide approximately 1.4 million cu yd capacity for material to be dredged from Black Rock Harbor and Bridgeport Harbor.

The planned end use of this containment facility is passive recreation. The 52-acre site will be a refuge for birds and other coastal animals. Fayerweather Island is in fact, a peninsula about 1.25 mi long, forming the southeastern bank of Black Rock Harbor channel. The upper 60 percent of the peninsula is about 0.25 mi wide, and comprises Seaside Park on the Long Island Sound side, and a landfill towards the upper end on the harbor side. This larger part of the peninsula is connected by a narrow neck of land about 0.15 mi long, with a small one-half acre "island" at the tip. The proposed location of the prototype facility is shown in Figure 5-2.

The containment facility would essentially fill in the narrow neck, making the peninsula approximately 1000 ft wide throughout its entire length. About 3800 ft of dike faced with one foot of riprap would be required on the Black Rock Harbor side. The final average surface elevation of the containment site would be about the same as most of Fayerweather Island at present. The surface of the completed containment facility would be 2 ft of clean material capable of supporting typical coastal grasses and trees which will be planted. Within five years after completion, the surface will be covered with grass and low trees. The final surface will vary approximately 5 ft in elevation to provide variation in habitat, and will be smoothly contoured for aesthetic appeal.

The average annual dredging needs of Bridgeport and Black Rock Harbor are about 136,000 cu yd. The 1.4 million cu yd containment facility could probably be filled within two years, or more, using hydraulic dredging and pipe transport. The dike could be constructed in March, April and May of the first year; filling would begin in the Fall of the first year, and would continue in other years. No dredging or material placement would occur during June, July, August and September.

The 20-ft high dike will be 15 ft above Mean Low Water, and will require about 70,000 cu yd of suitable material to be obtained from inland borrow pits. Assuming a Spring work schedule of approximately 60 working days (10 hr/day; 5 days/week; 3 months), between 2300 and 2600 truck loads of dike material will be required, using trucks ranging from 30 to 15 cu yd, respectively. Thus, trucks would arrive and depart the site at a rate of about 4 to 8 per hour, or one every 7 to 15 minutes, throughout the 10-hour working day, during the three-month dike construction period.

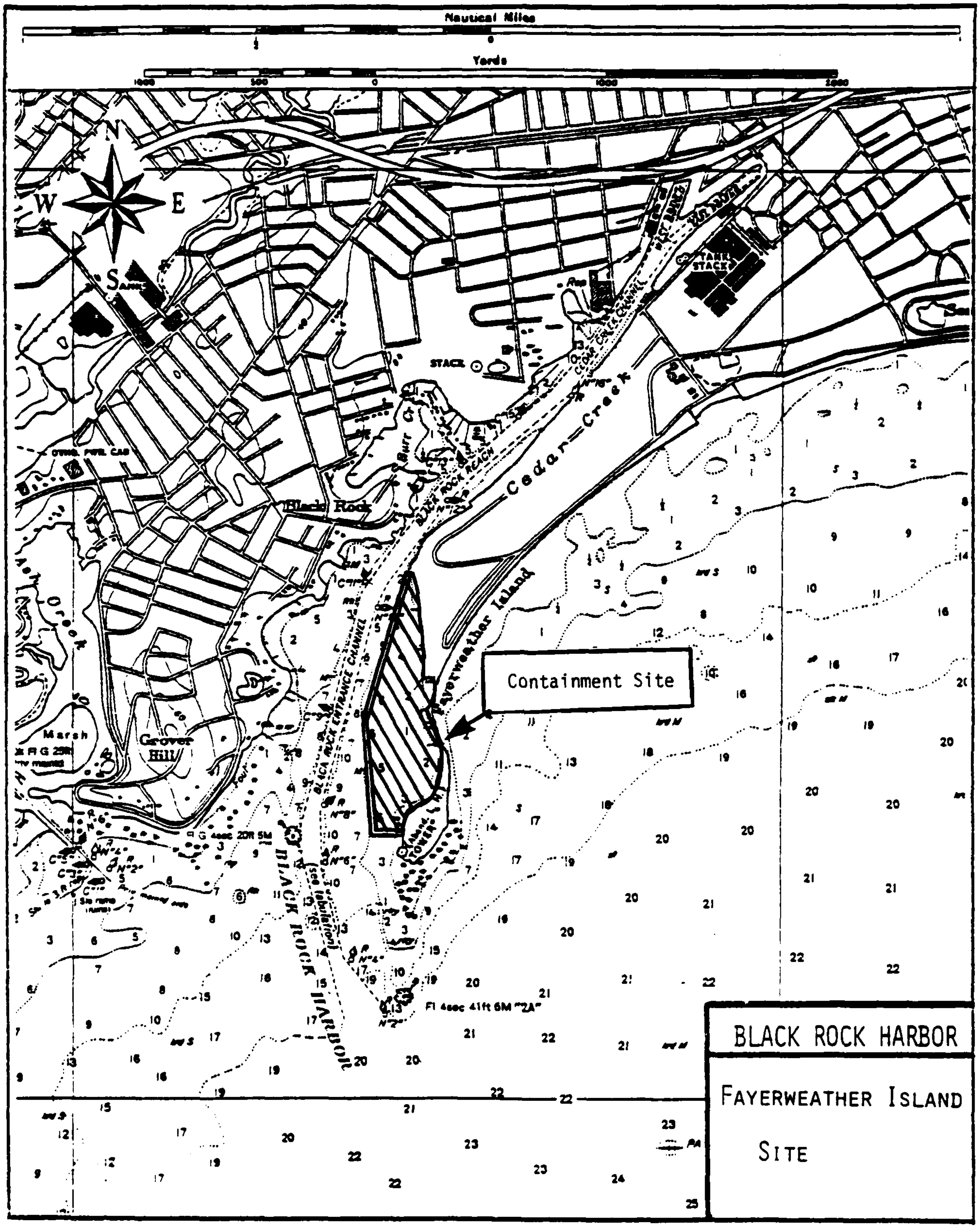

Figure 5-2. Proposed location of prototype dredged material containment facility.

When completed, the dike side of the containment facility will appear as a smoothly contoured continuation of the harbor side of the upper portion of the Fayerweather Island peninsula. It will look similar to the present rock seawall that runs along the Black Rock Harbor side and along the narrow neck of land connecting Fayerweather Island to the mainland. It will not be as close to the Black Rock Harbor channel as the upper (natural) shore. The vegetative cover on the gently contoured surface will provide a habitat for birds and other animals, and will appear as a natural coastal wild area. It will be ideally suited for passive recreation (birdwatching, etc.) typical of such areas (e.g., the Audubon Game Refuge on Cape Cod).

5.4 Social and Economic Impact Analysis

Background

In undertaking Work Order No. 8 for NED/CE, CEM staff performed the analysis of potential impacts in four steps:

1. Review and analysis of 49 dredging/disposal permits issued by NED/CE for Connecticut projects in 1979 and 1980, including:
   - o Agency and general public objections.
   - o Mitigating measures incorporated by the applicant in a revised permit application, in response to formal objections and informal "suggestions" by agencies and the general public.
   - o Special conditions in the permits imposed by NED/CE in response to objections, "suggestions," and/or NED/CE policy.
2. Review of the literature and selection of social, environmental, and economic attributes to be considered, including preparation of preliminary descriptions of each site.
3. On-site personal interviews and telephone contacts with opinion leaders and others to determine on-site public attitudes, and review of NED/CE workshop responses.
4. Preparation of more detailed scenarios for each containment facility, and subjective potential impact evaluation by CEM staff.

The results of the first step are presented in Section 4 of this report. The literature reviewed is cited in Appendix A. Summaries of personal interviews and telephone contacts are given in Appendix B. Appendix E summarizes the written responses to four NED/CE workshops held in May 1981 at New London, New Haven and Stamford, Connecticut, and Great Neck on Long Island.

Preliminary location maps were prepared for each facility, prior to conducting the public attitude survey. Discussions were held with NED/CE staff, based on preliminary results of the public attitude survey and cost analysis, and the more detailed scenarios were developed (see Section 5.3 above), taking into account many of the comments derived from the public attitude analysis and workshop responses.

Concurrent with the above work, CEM reviewed the literature on social, economic and environmental impact assessment. Using various sources, especially the Water Resources Assessment Methodology (WRAM) developed by the Corps of Engineers, and the Site Evaluation of Energy Conversion Systems (SELECS) methodology developed by CEM for the Department of Energy, five categories of impacts involving 22 attributes were chosen as being most appropriate for this social and impact analysis (4,5,6,7). Table 5-1 provides definitions of the 22 impact attributes.

TABLE 5-1

DEFINITIONS OF 22 IMPACT ATTRIBUTES

Category 1: LIFE, HEALTH, SAFETY

1. Boating Hazards: Those created by barges and support vessels during construction; and those due to containment areas.
2. Construction Hazards: Injuries to workers or to (illegal) visitors during dike building or during placing and grading dredged materials.
3. Final Use Hazards: Creating new land also creates a potential for more accidents as more people visit the site.
4. Traffic Congestion: The number of additional vehicles used during construction and final use is added to the number already present in the primary impact area.
5. Vectors (organisms which can carry and transmit disease): Norway rats and mosquitos are of concern.
6. Air Pollution: Particulate matter--especially dust from movement of dredged material that has been partially dewatered--is the principal pollutant to measure. Exhaust gases from various machines are also considered.

Category 2: COMMUNITY ORGANIZATION

7. Displacement of People: Need for road access during site construction may force relocation. Fishermen, and other commercial, industrial and recreational interests may suffer.
8. Zoning Compatibility: Final use of the site must agree with zoning regulations of the adjacent region. Potential for zoning waivers are considered.
9. Accessibility: Both physical (road access, elevated structures) and psychological (attractiveness of site) are considered.
10. Community Service: Increases in need and use of service personnel such as police, fire and maintenance persons.
11. Perceived Need for a Particular Final Use: What community persons feel and say about what their community needs or lacks the most.

Category 3: FINANCIAL

12. Land Value: Price of property surrounding or near a containment area may be affected; this will be considered.
13. Employment: The number of new jobs created by construction or by final use will be compared to those who are unemployed and are looking for jobs.

Category 4: EDUCATIONAL, CULTURAL, RECREATIONAL

14. Recreational Opportunities: Community population in relation to per capita recreational opportunity will be considered.
15. Educational Opportunities: Community size, number of projected visitors to the site, size of the site and "general educational enthusiasm" will be considered.
16. Proximity of a Cultural Resource: Are there theaters, museums, aquariums, universities or other landmarks close to the site?
17. Historical Significance: Sites in or similar to those in the *National Register of Historic Places* will be identified.

Category 5: AESTHETICS

18. Noise: Machinery used during construction and operation may add, temporarily, to noise level near the site.
19. Odors: Dredged material may contain sediments with organic composition that create odors dispersed by wind. The number of people in the primary impact area is of concern.
20. Exposure: This involves the number of people in in a community who might view and be visually affected by the containment area.
21. Compatibility: How does the proposed site fit in with what is around it? (This goes beyond the question of legal zoning requirements.)
22. Reduction in Panoramic View: Both the dike and the necessary operation equipment may interfere with the opportunities offered by shorelines for wide, unobstructed views.

The remainder of this section contains some of the more significant perceived impacts extracted from the public attitude survey and a subjective preliminary assessment of potential impacts. Because there were differences between the preliminary scenario used in the attitude survey and the more detailed scenario given in Section 5.3, many of the perceived impacts have parenthetical clarifying statements following them. Following next is an eight-page summary of the subjective impact analysis prepared by CEM staff, using the 22 impact attributes.

Perceived Major Social, Economic, and Environemntal Impacts

CEM staff visited proposed dredged material containment facility sites and interviewed pertinent persons, such as first selectmen (i.e., mayors), harbor masters, marina operators, and other opinion leaders. In some instances, telephone interviews with other relevant persons were also accomplished (see Appendix B).

Many of those interviewed were acquainted with a list of 22 potential impact attributes compiled by CEM. They were provided with a preliminary estimate of the size and other characteristics of the proposed containment facility, but not the detailed scenario presented above, which was prepared after the first phase of this economic and social impact analysis was completed, and includes mitigating measures suggested by NED/CE. The more significant perceived impacts extracted from the public opinion survey are presented next.

The following summarizes the major impacts extracted from personal and telephone interviews. Clarifying comments responding to some of the perceived major impacts are included parenthetically.

- o The boating hazards during construction will be potentially severe due to the large number of vessels that are moored in the harbor year-round. Accidents are rare but very serious. (No dredging from June through September is anticipated.)
- o The site is currently owned by Flowers Oyster Company, and many new oysters have recently been set; the entire site is affected.
- o Trucks or loud machinery should not be operated at night past local ordinances unless special mufflers are used. (No night work is anticipated.)
- o The extension may be seen as an opportunity to increase the size of the adjacent landfill, as opposed to renovating a floundering resource recovery plant in the area. It may be strongly objected to on that ground. Including a provision that the completed disposal facility will be donated to Connecticut for non-landfill use would be a good mitigation measure.
- o There will be a marked reduction in panoramic view from across the harbor, and the dike should be made as low as is technically feasible. There will be about a 35 percent reduction at one-half mile viewing range assuming only 30 feet upper limit above horizon. (The facility will have essentially the same height as the present seawall connecting Fayerweather Island to the mainland.)

- o An examination of potential increased siltation in the channel should be made due to the extended proximity of the site to the channel. (Circulation study of proposed breakwaters located at mouth of harbor indicated increased siltation not expected. The containment facility would be designed and operated to prevent loss of disposed material.)
- o Saint Mary's by the Sea, a residential area on the shore side of Black Rock Harbor, opposite Fayerweather Island, is considered to be the most exclusive in Bridgeport; many of the residences on the island are worth $300,000 and up.

Results of Subjective Analysis of Potential Impacts

In arriving at subjective judgments concerning the level of potential impacts that might stem from implementation of this prototype dredged material containment facility consideration was given to short-term impacts associated with the construction, filling, capping and final shaping and seeding of the containment facility, and to long-term impacts that would occur after the facility is completed and is in use. Impacts were assigned both for the primary region within one-mile radius of the facility, and in the secondary impact region of one to five miles radius about the site. Recent low altitude aerial color photography of the site and its surrounding region, as well as maps, personal ground visits and results of personal interviews and telephone contacts, were used as aids in the final process of arriving at judgmental decisions for the level of impacts that may occur.

The impact analysis occurred in three phases. First, a preliminary assessment was made, based on the public attitude response to the preliminary scenario, which described only the physical characteristics of the tentatively conceived prototype containment facility. The preliminary assessment was communicated to NED/CE, along with a more detailed draft scenario that included mitigating measures responsive to many of the significant potential impacts perceived by the public. The scenario presented in the section above was coordinated with NED/CE and then used along with all other pertinent information and data as a basis for the potential impact assessment presented in the following tabular form.

It is emphasized that detailed design, geological and benthic field tests, an environmental impact statement, and a series of public meetings will be accomplished before implementation can begin. It is also important to note that Congress must review and appropriate funds for each project. Thus many of the potential impacts described here may be subject to further mitigating measures before implementation of a prototype dredged material project begins.

SITE: FAYERWEATHER ISLAND/BLACK ROCK HARBOR PRIMARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Moderate	Floating pipeline principal hazard. Assume no dredging June through September. Much recreational and commercial boating activity.
• Construction Hazards	Moderate	Adjacent to public recreation area (Seaside Park).
• Final Use Hazards	Not applicable Short-term	
• Traffic Congestion	Moderate	Road haul of diking material likely.
• Vectors	Moderate	Surrounding problem not serious and acreage addition not large.
• Particulates	Moderate	Urban area has high background, but acreage small enough and duration only when dewatered.
2. COMMUNITY ORGANIZATION		
• Displacement	Large	New oyster beds presently set on proposed site; some boat mooring area taken.
• Zoning Compatibility	Not applicable Short-term	
• Accessibility	Moderate	Land access easy, and potential for curious boaters to visit site.
• Community Services	Negligible	No additional police surveillance expected.
• Perceived Need	Negligible (for open space)	Landfill must not be expanded onto new land.

SITE: Fayerweather Island (continued) PRIMARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	Negligible	Function of duration and proximity to residences.
• Employment	None	Few construction workers live within one-mile radius.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Small	Part of adjacent Seaside Park may be closed during constuction. Also, recreational boating may be curtailed.
• Educational Opportunities	Negligible	Viewing of construction.
• Cultural Resources	Negligible	Cultural resources within one-mile radius include Seaside Park and submerged archeological site on west side of Black Rock Harbor. (See Appendix F.)
• Historical Significance	Negligible	An old lighthouse on Fayerweather Island will not be disturbed, and submerged archeological site is quarter mile away on west side of Black Rock Harbor. (See Appendix F.)
5. AESTHETICS		
• Noise	Moderate	Assumes no night work. However, residential areas are found within impact area.
• Odors	Moderate	Disposal only in Spring and Fall. Material under water most of time, then capped with clean material.
• Exposure	Moderate	Residential areas across harbor, and part of Seaside Park.
• Compatibility	Small	Dredging equipment is similar in appearance to commercial shipping.
• Panoramic View	Small	DMCF and dredging equipment have low profiles.

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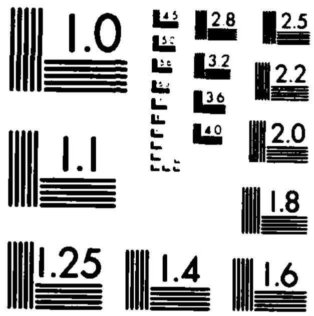
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SITE: FAYERWEATHER ISLAND/BLACK ROCK HARBOR SECONDARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Moderate	Possibility of pipeline or barges from Bridgeport Harbor. Assumes no dredging June through September.
• Construction Hazards	Small	Road hauls for dike material not large relative to other area traffic.
• Final Use Hazards	Not applicable Short-term	
• Traffic Congestion	Small	Assumes roads with superior capacity, such as turnpikes, used as much as possible.
• Vectors	Negligible	No problems resulting from site expected for whole community.
• Particulates	Negligible	Some dust may be created by trucks.
2. COMMUNITY ORGANIZATION		
• Displacement	None	People who live and/or work more than one mile from site not threatened.
• Zoning Compatibility	Not applicable Short-term	
• Accessibility	Negligible	Relatively few roads in the community provide access to the site.
• Community Services	Small	Little additional services expected to be required.
• Perceived Need	Not applicable Short-term	

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	Sufficient distance.
• Employment	Negligible benefit	Temporary openings for a few construction laborers possible.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Small	Small part of adjacent Seaside Park may be closed during construction. Also, recreational boating may be curtailed.
• Educational Opportunities	Negligible	A few people, particularly boaters, will be curious and come to visit.
• Cultural Resources	Negligible	Includes University of Bridgeport. (See Appendix F.)
• Historical Significance	None	
5. AESTHETICS		
• Noise	Negligible	None expected to exceed 70 db for any considerable duration
• Odors	Negligible	Duration limited--though worst conditions might allow permeation beyond one mile on rare occasions.
• Exposure	Negligible	Relatively few vantage points.
• Compatibility	Negligible	Obtrusive character of machinery reduced by distance.
• Panoramic View	Negligible	Distance sufficient that even a 15 ft MLW dike will not be noticed too much.

SITE: FAYERWEATHER ISLAND/BLACK ROCK HARBOR PRIMARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Negligible	Site not in the way of boat traffic.
• Construction Hazards	Not applicable Long-term	
• Final Use Hazards	Negligible	If developed as public park.
• Traffic Congestion	Negligible	No road access planned for final use.
• Vectors	Negligible	If graded to avoid ponding.
• Particulates	Negligible	No substantial quantity expected after grass planted.
2. COMMUNITY ORGANIZATION		
• Displacement	Moderate	Fishermen displaced by construction. Some boat mooring area lost.
• Zoning Compatibility	Negligible	Open space is compatible with present municipal park zoning.
• Accessibility	Moderately beneficial	Site can be approached on foot and by boat.
• Community Services	Negligible	No anticipated change in police or maintenance.
• Perceived Need	Small	Increase in open space adds marginally to adjacent Seaside Park.

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	None expected.
• Employment	None	None expected.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Small	Some boat mooring space lost, but new wildlife habitat established.
• Educational Opportunities	Small	Opportunities for bird-watching or contemplation of harbor.
• Cultural Resources	None	None known within one mile. (See Appendix F.)
• Historical Significance	Negligible	Old lighthouse at south end of site will remain as is.
5. AESTHETICS		
• Noise	None	No loud noises anticipated.
• Odors	None	Site will be capped with 2 ft of clean material.
• Exposure	Small	Primarily seen only by boaters and residents on west side of harbor.
• Compatibility	Negligible	Similar to adjacent park land.
• Panoramic View	Small	Dike will be 15 ft at MLW--very similar to existing sea wall which connects Fayerweather Island to mainland.

SITE: FAYERWEATHER ISLAND/BLACK ROCK HARBOR SECONDARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	None	
• Construction Hazards	Not applicable	
• Final Use Hazards	None	
• Traffic Congestion	None	
• Vectors	None	
• Particulates	None	
2. COMMUNITY ORGANIZATION		
• Displacement	None	
• Zoning Compatibility	Negligible	
• Accessibility	Negligible	
• Community Services	None	
• Perceived Need	Small benefit	Adds to available open space along shore. Adds wildlife habitat.

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	
• Employment	None	
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Small	Visits to wildlife habitat.
• Educational Opportunities	Small	Wildlife observation.
• Cultural Resources	Negligible	Site has no long-term effect on cultural resources. (See Appendix F.)
• Historical Significance	Negligible	Site has no long-term effect on cultural resources.
5. AESTHETICS		
• Noise	None	
• Odors	None	
• Exposure	Negligible	
• Compatibility	Negligible	
• Panoramic View	Negligible	

Fayerweather Island Site

The most potentially significant adverse impacts believed resulting from the creation of a DMCF at Fayerweather Island are associated with the primary impact area during the short-term. The highest ranked impact was displacement of oyster beds recently established at the proposed DMCF site. This displacement could affect revenues of oyster fishermen and would apply over the long-term as well. Some loss of boat mooring area of this high-value recreational and commercial harbor would also occur.

Other impacts associated with DMCF development relate to the location of the site adjacent to relatively high density residential, commercial and recreational facilities. Boating hazards--rated moderate—may arise due to the high levels of recreational and commercial boating activities, although dredging and disposal activities are likely to be conducted during off-peak, nonrecreational season periods. Similar assessment applies to possible conflicts with recreationists at adjacent Seaside Park because of easy land access to the site. Problems with odors, noise, vectors and visual exposure, to the extent they do occur, could be moderately adverse due to the close proximity of residential areas.

Over the long-term, creation of new land by the DMCF is viewed as having a small benefical impact if the land is utilized for nonstructural recreational and wildlife habitat purposes. Benefits as may accrue are considered small because created land areas are relatively small compared to already existing high value recreation space adjacent to the site. Of course, oyster beds displaced by the DMCF could not be replaced at the site.

5.5 Site Cost Analysis

Before discussing the specific cost elements of this containment facility it is useful to consider some of the assumptions and characteristics that are present in the different disposal methods—containment facility land disposal within one mile of the dredging site, disposal in Long Island Sound 10 miles from the dredging area and disposal in the open ocean about 100 miles from the dredging location.

Containment Facility

If the dredging site is within two miles of the containment facility, it is assumed that hydraulic dredging can occur and the material is transported to the facility through temporary floating pipeline. Usually if the dredging site is further than two miles, it is assumed that clamshell dredging occurs and the material is transported by barge. In the case of the facility at Fayerweather Island, hydraulic dredging and pipeline transportation out to three miles was assumed to include all of the dredging area in Bridgeport Harbor. The dredged material is deposited in a small transfer basin at a dike containment facility and then hydraulically pumped to various locations within the facility to fill it. The total cost of disposal of dredged material in the containment facility is computed from the sum of the costs of dredging, transportation, construction of the containment facility and operation of the containment facility during disposal of material.

Land Disposal

A critical assumption in this alternative is that land is available within one mile of each of the dredging sites that are included in the service area of a containment facility. This is certainly a very broad assumption given the reality of environmental constraints and social attitudes prevalent in some communities in the Long Island Sound region. However, land disposal, especially for maintenance dredging of rivers and small harbors with clean material and small volumes continues to be a viable economic option. Given the availability of land, hydraulic dredging is then assumed with pipeline transportation of dredged material.

The total cost of land disposal is strongly influenced by assumptions made concerning the possible cost of obtaining the land for use for disposal of dredged material. It is assumed that the land is available for this use at essentially no charge since, presumably after fill and development, the value of the land for sale or other use should be at least what it was initially The unit cost (dredging, transportation and disposal) is always least for land disposal compared with the other alternatives considered. However, if it were assumed that land must be acquired for the purpose of disposal of dredged material and that the purchase price is $30,000 per acre, the land disposal unit cost might be greater than the cost for disposal in a containment facility.

Long Island Sound Disposal

The critical assumption of the alternative method of disposal in Long Island Sound is that a site is available approximately 10 miles from the area of dredging activity. The disposal site is assumed to be an average distance of 10 miles from all dredging sites associated with a particular containment facility. In all cases it is assumed that clamshell dredging occurs and the dredged material is transported to the disposal site by barge. Based on the Statement of Work, for comparative purposes, a unit cost is computed for the dredging and transportation and is, therefore, a fixed value of $4.20/cu yd that will not vary with the dredging associated with different containment facilities.

Open Ocean Disposal

The assumptions for open ocean disposal are similar to those for disposal in Long Island Sound with the exception that the disposal site is assumed to be an average distance of 100 miles offshore from the dredging activity. With the assumptions of clamshell dredging and barge transport, a fixed unit cost of $6.60/cu yd is obtained for comparison with costs of other disposal options.

The basic cost factors common to all sites and used in the costing computations are given in Table 5-2. These cost factors are discussed in Section 11.0.

TABLE 5-2

COST FACTRS USED IN COMPUTATIONS

Operation	Cost
Hydraulic Dredging	\$ 1.00/cu yd
Clamshell Dredging	\$ 1.50/cu yd
Barge Transportation to 10 Miles	\$ 2.70/cu yd
Barge Transportation to 100 Miles	\$ 5.10/cu yd
Temporary Pipeline Transportation	\$ 0.325 mil /mile*
Open Water Dike Construction	Cost/mile = $(1.5\,H^2 + 10H)\ \$2374 + K_1HT_1 + K_2HT_2$
Sheltered Water Dike Construction (Beach)	Cost/mile = $(1.0H^2 + 10H)\ \$2347 + K_2HT_1 + K_2HT_2$, where T_2 = sheltered riprap thickness (ft), K_2 = \$6914 and $K_1 = \begin{cases} \$\,10{,}932, & T_1 = 1\text{-}2 \text{ ft} \\ \$\,52{,}565 & T_1 = 4 \text{ ft.} \end{cases}$
Containment Facility Operation	\$ 50,000/year
Acquisition of Land for Land Disposal	Nothing or \$ 30,000/acre
Construction and Operation of Land Disposal	\$ 0.50/cu yd

*This represents a 30% increase over the usual cost of $0.25 mil/mile to reflect the requirements of a booster pump for the 3-mile transportation distance.

Table 5-3 presents the pertinent overall physical characteristics of the containment facility (dike length and height and containment facility area and capacity) as well as the time period estimated for filling the facility and the source of dredged materials. Additional special characteristics are noted. In the case of the prototype containment facility of Fayerweather Island, the cost of construction of the dike is computed assuming a rubble mound dike in sheltered water with a 1:1 slope, faced with one foot of riprap. Only dredged material available locally from Bridgeport Harbor and Black Rock Harbor would be used in filling the containment facility over a period of 15 years. If it is assumed that 100 percent rather than 10 percent of material from improvement dredging was to be deposited in the facility, and if it is also assumed that several years worth of material from delayed maintenance dredging is immediately available, the period for filling the containment facility could be shortened considerably—perhaps to as little as two years

TABLE 5-3

FAYERWEATHER ISLAND CONTAINMENT FACILITY CHARACTERISTICS

Item	Units	Hydraulic Dredging Scenario
Containment Facility Dike Length	ft	3800
Containment Facility Dike Height	ft	20
Containment Facility Exposed Surface Slope	--	1:1
Containment Facility Riprap Thickness or Exposed Surface	ft	1
Containment Facility Area	acres	52
Containment Facility Capacity	cu yd	1,400,000
Period of Disposal	yr	15
Source and Amount of Dredged Material	cu yd	
Bridgeport (3 miles)		1,215,000
Black Rock Harbor (1 mile)		195,000
Total Dredged Material	cu yd	1,410,000
Special Remarks: Construction of a rubble mound dike in sheltered water with a 1:1 slope is assumed.		

A comparison of the total cost and unit costs obtained for each disposal alternative is given in Table 5-4. Cost analysis indicates the most economical method of disposing of dredged material from Bridgeport harbor to be land disposal. This conclusion, however, is dependent on the availability of land at no cost within one mile of dredging, which may not be possible. Approximately 87 acres would be needed assuming an average fill depth of 10 feet.

TABLE 5-4

COMPARISON OF COSTS OF ALTERNATIVE METHODS OF DISPOSAL
WITH DISPOSAL AT FAYERWEATHER ISLAND CONTAINMENT FACILITY

Disposal Method	Dredging Method	Transport Method	Costs ($ Millions)					Unit Cost ($/cu yd)
			Dredging	Transport	Construct.	Disposal	Total	
Containment Facility	1. Hydraulic 2. Clamshell 3. Hydraulic (%) Clamshell (%)	Pipe (3 mi) Barge (mi) Pipe (mi) Barge (mi)	1.410	1.225	1.212	0.750	4.597	3.26
Land	4. Hydraulic	Pipe (1 mi)	1.410	0.500	-	0.705	2.615	1.85
Long Island Sound	5. Clamshell	Barge (10 mi)	2.115	3.807	-	-	5.922	4.20
Ocean	6. Clamshell	Barge (100 mi)	2.115	7.191	-	-	9.306	6.60

If a $30,000/acre cost of land acquisition is assumed, the unit cost of land disposal would be $3.71/cu yd rather than the $1.85/cu yd computed under the assumption of no-cost land availability. With this assumption, land disposal would be less economical than disposal in the proposed containment facility.

The unit cost of disposal at the Fayerweather Island Containment Facility is $3.26/cu yd. This is considerably less than the unit cost for disposal in Long Island Sound and less than half the cost of open ocean disposal. It must be kept in mind, however, that with the availability of dredged material close to the containment facility, allowing hydraulic dredging and short distance pipeline transportation of material, a controlling element of the cost analysis is the cost of construction of the containment facility at Fayerweather Island. Cost of construction of the dike and filling the facility accounts for 43 percent of the total cost under the assumptions cited. The construction of the dike alone accounts for 26 percent of all costs. Significant increases or decreases in the cost of construction of the containment facility would greatly alter the unit cost. It should also be noted that if the period of disposal was considerably shortened, the unit cost would decrease to less than $3.00/cu yd.

5.6 Summary

The 1.4 million cu yd containment facility at Fayerweather Island will be created by a 3800 ft long dike having an elevation of 15 ft above Mean Low Water, along the southeastern shore of Black Rock Harbor. The dike will be faced with one foot of riprap on a 1:1 slope. The 52-acre facility would essentially make the Fayerweather Island peninsula approximately 1000 ft wide throughout most of its length, similar to its present landward end. The planned final use of the site is passive recreation and the area would be a refuge for birds and other coastal animals. Its final appearance will be very similar to existing vegetated areas. The most significant adverse impact will be the elimination of an active shellfishing area.

There will be no dike construction, dredging or material placement during the months of June, July, August and September; and no night work is anticipated at any time. The dike would be constructed in March, April and May of the first year; filling could begin in the Fall of the first year and would continue for two or more years. The dike will require 70,000 cu yd of material transported by truck from inland borrow pits.

The unit cost of disposal at the Fayerweather Island prototype dredged material containment facility is \$3.10/cu yd, which is less than either disposal in Long Island Sound (\$4.20/cu yd) or open ocean disposal (\$6.60/cu yd). However, land disposal is the most economical disposal method at \$2.00/cu yd, if it is assumed that land for fill is available at no cost within one mile of all dredging no dikes or no water treatment are required and hydraulic dredging is carried out with transport of the dredged material by temporary pipeline to the disposal site. The unit cost for containment facility disposal is dependent on the assumption of all fill material coming from local hydraulic dredging with temporary pipeline transport for distances up to three miles, thus including all of Bridgeport Harbor. The unit cost is also affected by the cost of dike construction and the assumption of a 1:1 slope (sheltered dike) and surfacing with one foot of riprap on both sides.

5.7 References

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6.0 SITE ANALYSIS #2: YELLOW MILL CHANNEL/BRIDGEPORT HARBOR

6.1 Introduction

This section presents the detailed results of the analysis of social and economic impacts associated with the construction and final use of a prototype dredged material containment facility at Yellow Mill Channel in Bridgeport Harbor. Short-term impacts during construction of dikes, filling with dredged material, dewatering, and final capping smoothing, and planting have been examined, as well as long-term impacts involving final use.

The background material essential for assessing impacts is summarized in Section 6.2 A scenario for the construction, filling and completion of the containment facility is given in Section 6.3. The short-term and long-term socioeconomic impacts are presented and evaluated in Section 6.4. The cost analysis is given in Section 6.5 and a summary of the most pertinent results is given in Section 6.6.

It should be recognized that the prototype containment facility at Yellow Mill Channel in Bridgeport Harbor and the facility at Black Rock Harbor have been studied separately. If both prototype facilities were built, one would anticipate that a coordinated and probably time-phased sequence of construction and filling of each facility would occur.

6.2 Background

Bridgeport is located about 50 miles northeast of New York City and about 19 miles southwest of New Haven, Connecticut. The city of Bridgeport occupies 17.5 square miles. In 1980, approxiamtely 142,500 persons resided in the city. The population decreased by 8.9 percent between 1970 and 1980. However, it is still ranked as Connecticut's most populous city. The population density is 8,142 persons per square mile (1,2).*

In 1980, 55,291 housing units could be found in the city and total housing units increased 1.1 percent between 1970 and 1980 (2). Access to Bridgeport is by way of highways such as Route I-95, Route 1, Route 8 and other smaller secondary roads; railroad; boat; and ferryport. There is also an airport in the city. About 69,995 taxable motor vehicles were assessed in the city in 1977 (3). The tax rate in Bridgeport was 64.9 mills for the year 1978-1979 with a net taxable grand list of $893,128,873. The mean per capita income was $4,547 in 1975. This is about $1,000 below the state average (3).

*Numbers refer to references at the end of this section.

Important basic industries in the area include manufacturing, trade and port-related activities. Major manufacturing, much of which is defense industry-related includes: firearms, brass goods, aluminum and zinc castings and valves, electronic appliances, wiring devices, aircraft and plastics.

In the city of Bridgeport land use is as follows: (1)

Type	Acres	Percent of Total
Residential	5,642	54.4
Commercial/Industrial	2,677	25.8
Other	1,606	15.8
Unused	441	4.0

Bridgeport Harbor and Black Rock Harbor handled about 3.5 million tons (one-sixth) of Connecticut's waterborne commerce in 1977. Of this total, 80 percent, or 2.8 million tons, was petroleum products. Electric utilities in Bridgeport consumed about one-fourth of all petroleum products entering the port. Sand, crushed rock and scrap are nonpetroleum products passing through the ports.

A total of 21 piers, wharves and docks are located in the inner section of the main harbor and along the Yellow Mill Channel and the Pequonnock and Johnsons Rivers. The description of terminal facilities for Bridgeport Harbor is given below.

Three waterfront facilities are used for the receipt and/or shipment of petroleum products, one of these for bunkering vessels; two are used for the receipt of fuel oil for plant consumption; one for the shipment of scrap metal; and two are used for the receipt of sand, stone, lumber, steel products, pumice, marble and shipping containers in feeder barge service--one of these is also used for the shipment of scrap metal. One facility is a terminal for ferries operating between Bridgeport and Port Jefferson, Long Island, N.Y.; one is used for repairing small vessels; and eleven were not being used at the time of survey (4). Five waterfront facilities are equipped to receive and/or ship petroleum products--one of these provides bunkering for vessels; two are owned and operated by industries for the receipt of fuel oil for plant consumption. Three storage warehouses are available having a total of almost 470,000 sq ft of dry storage space (4).

On the whole, there is little land available for development along the Bridgeport Harbor front, as much of the land although under-utilized, is committed to existing users. Most of the land is devoted to nonwater-dependent activities. The majority of shore frontage is used for industrial purposes, as shown on the zoning map of Figure 6-1. Water-related uses such as marinas, parks, beaches, etc., are

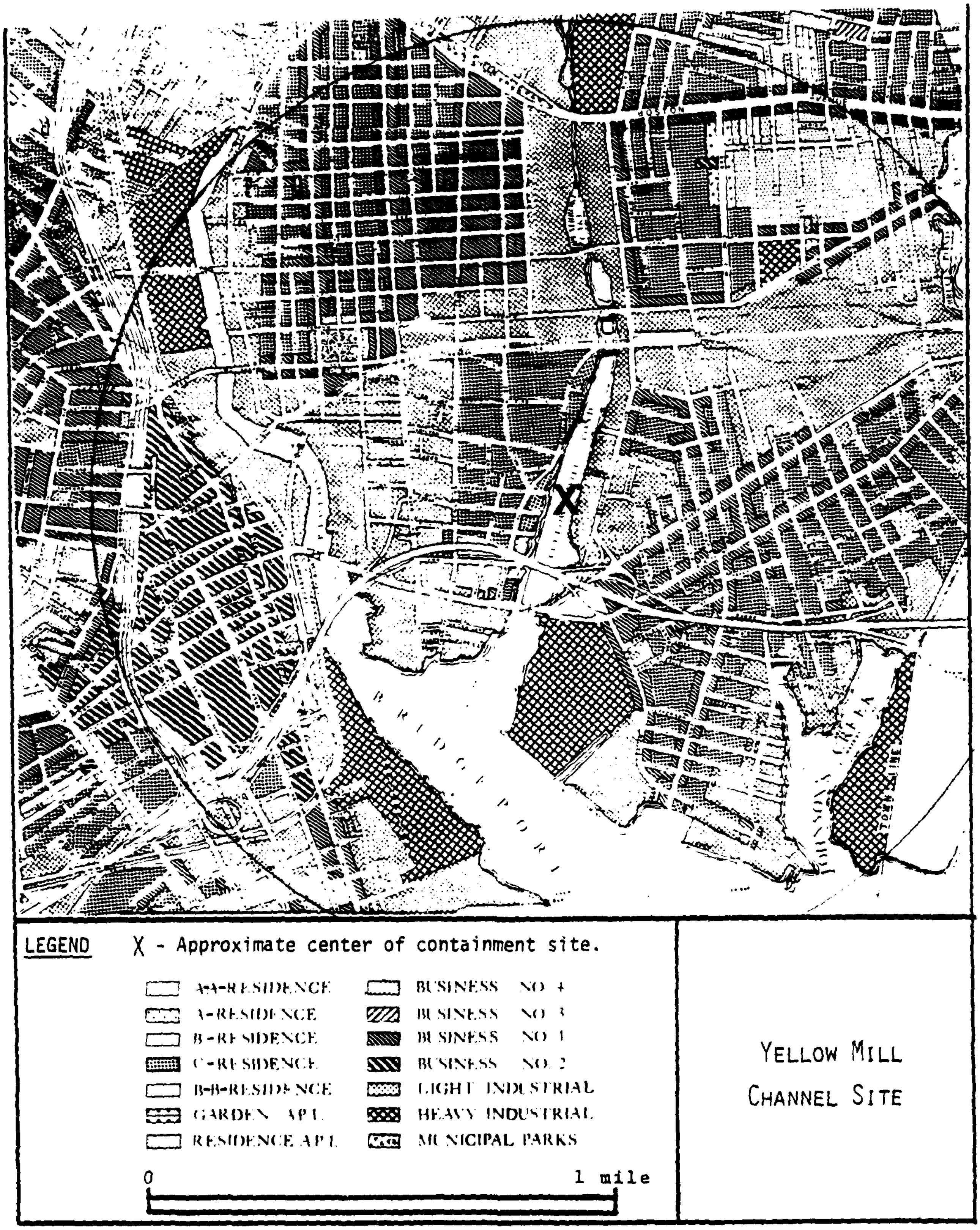

Figure 6-1. Zoning map for Yellow Mill Channel site.

underdeveloped with generally inadequate facilities (5). Eight marinas, yacht clubs and boat yards are located within Bridgeport Harbor. There are long waiting lists for wet storage spaces at many existing marinas in Bridgeport. Both power and sailboats of most sizes are accommodated in the marinas.

Approximately 31,281 persons live within a one-mile radius of Yellow Mill Channel. The area is a mix of residential housing, light industry and business. Within the primary impact area there are about 19 schools, the Town Hall, police station, library, Federal Court House. a city park, and Bridgeport hospitals. Yellow Mill Channel is surrounded by a heavily industrial waterfront. Located within the lower reach of Yellow Mill Creek are three marine recreation facilities. They are Hitchcock Gas Engine Co., Inc., Pequonnock Yacht Club and Riverside Marina. Jacob Brothers' metal company is the only user completely within the site itself, though D'Addario Sand and Gravel is quite close to the site. The acreage of parks in the primary impact area is quite small and the addition of a large (16.5 acre) park in Yellow Mill Channel would provide an important recreational facility for residents of the inner city The filling of the channel would prevent the continuing occurrence of drownings of children from the immediate area, as well as reduce rodent habitat.

6.3 Yellow Mill Channel Scenario

The objective of the Yellow Mill Channel containment facility is to provide capacity for approximately 500,000 cu yd of material, to be dredged primarily from Bridgeport Harbor.

The ultimate use of the 16.5-acre dredged material containment facility is expected to be recreation fields, to be used by the inhabitants of the densely-populated surrounding area. The dredged material would be placed in the upper 1400 ft of Yellow Mill Channel. The channel will be blocked off by a dike 25 ft high, which will rise 20 ft above Mean Low Water. The dike will be constructed of impervious material, hauled by truck from inland borrow pits. It will be faced with one foot of riprap on both sides and the top may be capped with a hard-surface path, suitable for jogging and cycling. The proposed location of the prototype facility is shown in Figure 6-2.

The dike for the containment facility would be constructed within a three-month period--March, April and May. Several storm drains, one of which also accommodates normal streamflow from Success Lake and Stillman Pond, now empty into the upper reach of Yellow Mill Channel. These would be extended to empty on the harbor side of the dike. No dredging work would occur in June, July, August and September.

The annual average dredging requirement for Bridgeport Harbor is about 136,000 cu yd (i.e., 55,000 cu yd of maintenance material, 50,000 cu yd of improvement material and 31,000 cu yd of private material). Bridgeport Harbor has not been dredged recently. Therefore, the containment facility could be filled in the course of one or two years. Dredging would be performed using a hydraulic dredge with floating pipe transport, operating within Bridgeport Harbor only. An alternative is filling the containment facility over a two-year period using material removed from Bridgeport or other harbors by clamshell and barged to the containment facility. Also, a mix of local hydraulic dredged material from Bridgeport Harbor and barged material from other harbors might be used, resulting in complete filling of the containment facility within one or two years.

To prevent trespassing on the construction site, a chain-link fence would be placed around the upper reach of Yellow Mill Channel. When dewatering is completed, the surface of the containment facility will be capped with clean sand and a layer of top soil, suitable for the surface of a recreation area for softball fields, etc. The final elevation would be essentially that of the present banks of the Channel.

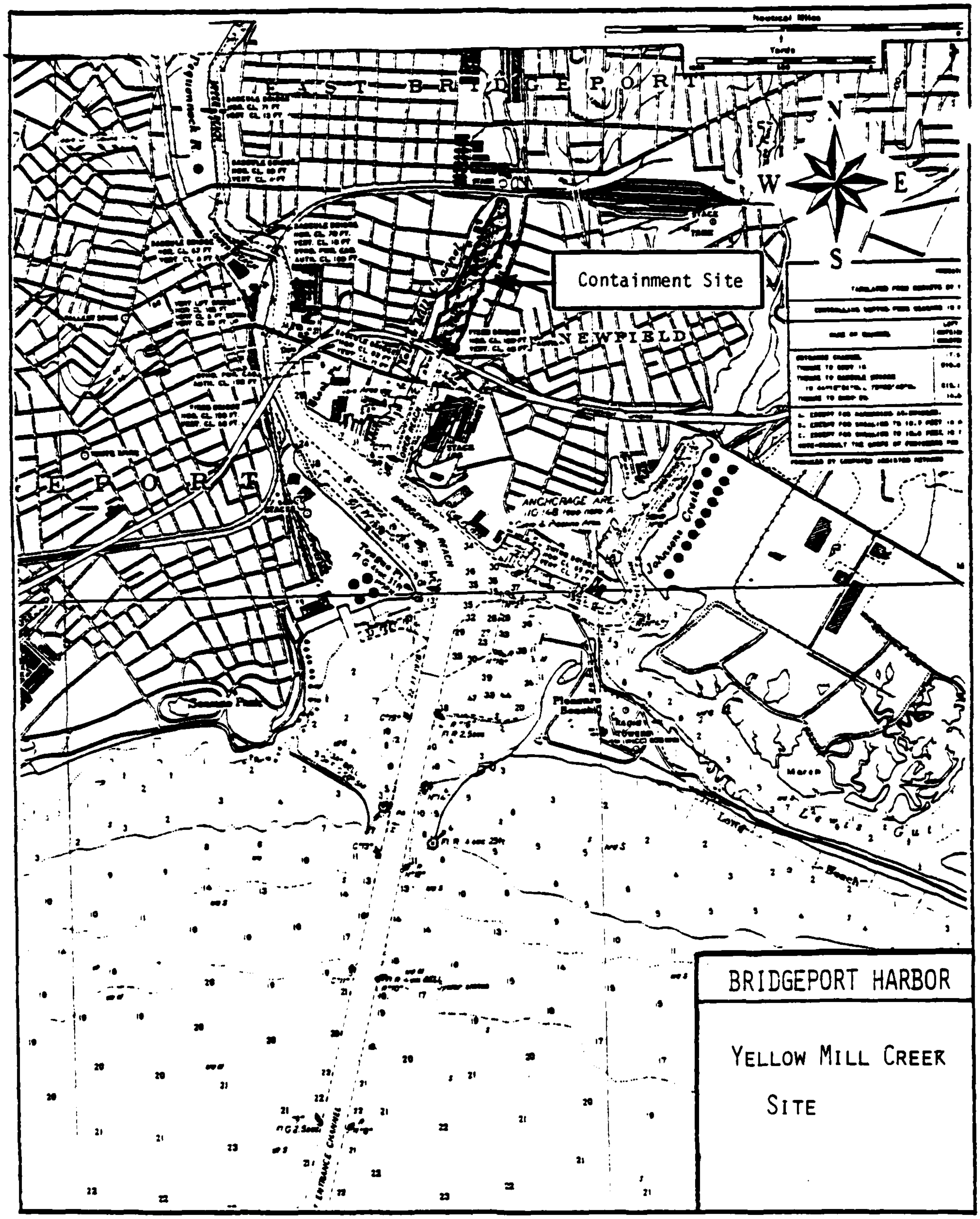

Figure 6-2. Proposed location of prototype dredged material containment facility.

Construction of the dike would require about 16,000 cu yd of suitable material from inland borrow pits. This volume of material would require 800 to 1600 truck movements (for truck capacities of 20 and 10 cu yd, respectively), or about one to three truck loads arriving at the construction site per 10-hr work day, five days/week for three months. Hauling need not take place at night or on weekends. Installation of the seven storm drain extensions would take place during dike construction, and might involve the setting of temporary sheet pilings by pile drivers to allow water removal in the area where the storm water drain collector would be located and a single large storm water drain extension would be constructed. Pile driving if needed, would take place only during daytime on week days.

6.4 Social and Economic Impact Analysis

Background

In undertaking Work Order No. 8 for NED/CE, CEM staff performed the analysis of potential impacts in four steps:

1. Review and analysis of 49 dredging/disposal permits issued by NED/CE for Connecticut projects in 1979 and 1980 including:
   - o Agency and general public objections.
   - o Mitigating measures incorporated by the applicant in a revised permit application, in response to formal objections and informal "suggestions" by agencies and the general public.
   - o Special conditions in the permits imposed by NED/CE in response to objections, "suggestions," and/or NED/CE policy
2. Review of the literature and selection of social, environmental, and economic attributes to be considered, including preparation of preliminary descriptions of each site.
3. On-site personal interviews and telephone contacts with opinion leaders and others to determine on-site public attitudes, and review of NED/CE workshop responses.
4. Preparation of more detailed scenarios for each containment facility, and subjective potential impact evaluation by CEM staff.

The results of the first step are presented in Section 4 of this report. The literature reviewed is cited in Appendix A. Summaries of personal interviews and telephone contacts are given in Appendix B. Appendix E summarizes the written responses to four NED/CE workshops, held in May 1981 at New London, New Haven and Stamford, Connecticut. and Great Neck on Long Island.

Preliminary location maps were prepared for each facility, prior to conducting the public attitude survey. Discussions were held with NED/CE staff, based on preliminary results of the public attitude survey and cost analysis, and the more detailed scenarios were developed (see Section 6.3 above), taking into account many of the comments derived from the public attitude analysis and workshop responses.

Concurrent with the above work, CEM reviewed the literature on social, economic and environmental impact assessment. Using various sources, especially the Water Resources Assessment Methodology (WRAM) developed by the Corps of Engineers, and the Site Evaluation of Energy Conversion Systems (SELECS) methodology developed by CEM for the Department of Energy, five categories of impacts involving 22 attributes were chosen as being most appropriate for this social and impact analysis (6,7,8,9). Table 6-1 provides definitions of the 22 impact attributes.

TABLE 6-1
DEFINITIONS OF 22 IMPACT ATTRIBUTES

Category 1: LIFE, HEALTH, SAFETY

1. Boating Hazards: Those created by barges and support vessels during construction; and those due to containment areas.
2. Construction Hazards: Injuries to workers or to (illegal) visitors during dike building or during placing and grading dredged materials.
3. Final Use Hazards: Creating new land also creates a potential for more accidents as more people visit the site.
4. Traffic Congestion: The number of additional vehicles used during construction and final use is added to the number already present in the primary impact area.
5. Vectors (organisms which can carry and transmit disease): Norway rats and mosquitos are of concern.
6. Air Pollution: Particulate matter--especially dust from movement of dredged material that has been partially dewatered--is the principal pollutant to measure. Exhaust gases from various machines are also considered.

Category 2: COMMUNITY ORGANIZATION

7. Displacement of People: Need for road access during site construction may force relocation. Fishermen, and other commercial, industrial and recreational interests may suffer.
8. Zoning Compatibility: Final use of the site must agree with zoning regulations of the adjacent region. Potential for zoning waivers are considered.
9. Accessibility: Both physical (road access, elevated structures) and psychological (attractiveness of site) are considered.
10. Community Service: Increases in need and use of service personnel such as police, fire and maintenance persons.
11. Perceived Need for a Particular Final Use: What community persons feel and say about what their community needs or lacks the most.

Category 3: FINANCIAL

12. Land Value: Price of property surrounding or near a containment area may be affected; this will be considered.
13. Employment: The number of new jobs created by construction or by final use will be compared to those who are unemployed and are looking for jobs.

Category 4: EDUCATIONAL, CULTURAL, RECREATIONAL

14. Recreational Opportunities: Community population in relation to per capita recreational opportunity will be considered.
15. Educational Opportunities: Community size, number of projected visitors to the site, size of the site and "general educational enthusiasm" will be considered.
16. Proximity of a Cultural Resource: Are there theaters, museums, aquariums, universities or other landmarks close to the site?
17. Historical Significance: Sites in or similar to those in the *National Register of Historic Places* will be identified.

Category 5: AESTHETICS

18. Noise: Machinery used during construction and operation may add, temporarily, to noise level near the site.
19. Odors: Dredged material may contain sediments with organic composition that create odors dispersed by wind. The number of people in the primary impact area is of concern.
20. Exposure: This involves the number of people in in a community who might view and be visually affected by the containment area.
21. Compatibility: How does the proposed site fit in with what is around it? (This goes beyond the question of legal zoning requirements.)
22. Reduction in Panoramic View: Both the dike and the necessary operation equipment may interfere with the opportunities offered by shorelines for wide, unobstructed views.

The remainder of this section contains some of the more significant perceived impacts extracted from the public attitude survey and a subjective preliminary assessment of potential impacts. Because there were differences between the preliminary scenario used in the attitude survey and the more detailed scenario given in Section 6.3, many of the perceived impacts have parenthetical clarifying statements following them. Following next is an eight-page summary of the subjective impact analysis prepared by CEM staff, using the 22 impact attributes.

Perceived Major Social, Economic, and Environmental Impacts

CEM staff visited proposed dredged material containment facility sites and interviewed pertinent persons, such as first selectmen (i.e., mayors), harbor masters, marina operators, and other opinion leaders. In some instances, telephone interviews with other relevant persons were also accomplished (see Appendix B).

Many of those interviewed were acquainted with a list of 22 potential impact attributes compiled by CEM. They were provided with a preliminary estimate of the size and other characteristics of the proposed containment facility, but not the detailed scenario presented above, which was prepared after the first phase of this economic and social impact analysis was completed, and includes mitigating measures suggested by NED/CE. The more significant perceived impacts extracted from the public opinion survey are presented next.

The following summarizes the major impacts extracted from personal and telephone interviews. Clarifying comments responding to some of the perceived major impacts are included parenthetically

- o There are several high-rise residences adjacent or near to the site, and the total population within a one-mile radius is greater than 30,000.
- o Construction should consider 100-year flood problems associated with extending the seven storm drains and an upstream source.
- o Jacob Brothers Scrap Metal Company will no longer be able to send shipments by barge, and D'Addario Sand and Gravel is just below the proposed DMCF. (The extent of Jacob Brothers' p sent level of operation is not known)
- o The area neighborhood is perceived to be the "worst" in Bridgeport; rock-throwing and near riots have occurred in 1981.
- o Commercial establishments lining the east bank prevent access from that direction to a park that might be built on the completed containment facility. (However, many other parks have the same limitation.)
- o Bridgeport's community services are facing serious cutbacks, and any recreation facility development may require Federal funding.
- o Location of an Indian pottery ground adjacent to the site may require some specific mitigation. (The specific effects of the project have not yet been determined)

- o Construction noise during nights and summer will be objected to due to the high population density adjacent to the site. (No night work is anticipated.)
- o The need for a park in such a high-density region of Bridgeport can go a long way towards overcoming the adverse impacts associated with the project. Several drownings have occurred in the pond, and past discussion of filling it in has generally been quite favorably received.

Results of Subjective Analysis of Potential Impacts

In arriving at subjective judgments concerning the level of potential impacts that might stem from implementation of this prototype dredged material containment facility consideration was given to short-term impacts associated with the construction, filling, capping and final shaping and seeding of the containment facility, and to long-term impacts that would occur after the facility is completed and is in use. Impacts were assigned both for the primary region within one-mile radius of the facility and in the secondary impact region of one to five miles radius about the site. Recent low altitude aerial color photography of the site and its surrounding region, as well as maps, personal ground visits and results of personal interviews and telephone contacts, were used as aids in the final process of arriving at judgmental decisions for the level of impacts that may occur.

The impact analysis occurred in three phases. First, a preliminary assessment was made, based on the public attitude response to the preliminary scenario, which described only the physical characteristics of the tentatively conceived prototype containment facility. The preliminary assessment was communicated to NED/CE, along with a more detailed draft scenario that included mitigating measures responsive to many of the significant potential impacts perceived by the public. The scenario presented in the section above was coordinated with NED/CE and then used along with all other pertinent information and data as a basis for the potential impact assessment presented in the following tabular form.

It is emphasized that detailed design, geological and benthic field tests, an environmental impact statement, and a series of public meetings will be accomplished before implementation can begin. It is also important to note that Congress must review and appropriate funds for each project. Thus, many of the potential impacts described here may be subject to further mitigating measures before implementation of a prototype dredged material project begins.

SITE: YELLOW MILL CHANNEL/ BRIDGEPORT HARBOR PRIMARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Small	Floating pipeline principal hazard. Commercial and some recreational boating exposed. No summer dredging.
• Construction Hazards	Moderate	High density residential area adjacent to site.
• Final Use Hazards	Not applicable Short-term	
• Traffic Congestion	Moderate	Site in industrial area where truck traffic is common.
• Vectors	Moderate benefit	Habitat for rodents living in Yellow Mill Channel will be reduced.
• Particulates	Small	Only small site involved. Region presently violates 24-hour particulate standard.
2. COMMUNITY ORGANIZATION		
• Displacement	Large	D'Addario Sand & Gravel, and Jacob Brothers Metal Company may lose barge dock facilities.
• Zoning Compatibility	Not applicable Short-term	
• Accessibility	Moderate	Construction operations will have many curious viewers. Children may try to enter site and some may be injured (i.e., attractive nuisance).
• Community Services	Small	Small increased police protection may be required.
• Perceived Need	Not applicable Short-term	

SITE: Yellow Mill Channel (continued) PRIMARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	Negligible	Construction will be relatively short.
• Employment	Small beneficial	Unemployment high; construction may give rise to a few short-term jobs.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Small	Dredging, construction and disposal activities scheduled for non-recreation seasons.
• Educational Opportunities	Negligible	Viewing of construction.
• Cultural Resources	Negligible	Dike construction can occur using access through industrial area on southeast bank. (See Appendix F.)
• Historical Significance	Potentially large	Two Indian pottery sites are located in an industrial area about two blocks east of east bank of project. Location needs continuation. (See Appendix F)
5. AESTHETICS		
• Noise	Moderate	No nighttime construction. Daytime construction will affect the highly populated part of area. Area already noisy.
• Odors	Large	High density residential area adjecent. Dredged material will be highly organic.
• Exposure	Moderate	Site can be viewed by some of the residents of the nearby housing project and from roadway at northeast end.
• Compatibility	Small	Dredging and disposal equipment similar to existing equipment in area.
• Panoramic View	Negligible	No real panoramic view to begin with from ground level.

SITE: YELLOW MILL CHANNEL/BRIDGEPORT HARBOR SECONDARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Small	Pipeline transport. All dredged material for site will probably come from Bridgeport Harbor within 2 miles.
• Construction Hazards	Small	If road haul of dike material on available high capacity highways.
• Final Use Hazards	Not applicable Short-term	
• Traffic Congestion	Small	Assumes roads with superior capacity, such as turnpikes, used as much as possible.
• Vectors	Negligible	No increase expected on a community-wide basis.
• Particulates	Negligible	Some dust may be created by trucks.
2. COMMUNITY ORGANIZATION		
• Displacement	None	People who live and work more than one mile from site not influenced.
• Zoning Compatibility	Not applicable Short-term	
• Accessibility	Negligible	Many routes lead into one mile radius from site, but few visitors expected.
• Community Services	None	None expected to be required.
• Perceived Need	Not applicable Short-term	

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	Sufficient distance.
• Employment	Negligible benefit	Opportunities will only be temporary.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Negligible	
• Educational Opportunities	Negligible	Few expected to come and visit from more than one mile away.
• Cultural Resources	Negligible	No effect expected, as long as trucks travel to and from borrow pits on available interstate highways. (See Appendix F.)
• Historical Significance	Negligible	No effect expected, as long as trucks travel to and from borrow pits on available interstate highways.
5. AESTHETICS		
• Noise	Moderate	Assumes no night work.
• Odors	Negligible	Ground obstructions enhance diffusion.
• Exposure	Negligible	Relatively few vantage points beyond one mile from site.
• Compatibility	Negligible	Obtrusive character of machinery for site construction and fill will be reduced by distance.
• Panoramic View	Negligible	Short dike viewed primarily only from roadway and lower channel.

SITE: YELLOW MILL CHANNEL/BRIDGEPORT HARBOR PRIMARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Negligible	Not in the way of vessels.
• Construction Hazards	Not applicable Long-term	
• Final Use Hazards	Negligible	Final use will be recreational ball fields.
• Traffic Congestion	Negligible	Primarily to be used by children and local athletic leagues.
• Vectors	Large benefit	Rat breeding ground reduced.
• Particulates	Negligible	Small amount generated from park usage.
2. COMMUNITY ORGANIZATION		
• Displacement	Large	Jacob Brothers and D'Addario Sand & Gravel may not be able to ship effectively by other than barge.
• Zoning Compatibility	Large benefit	Park would be greatly appreciated by residents.
• Accessibility	Large benefit	Almost 32,000 people within one mile can enjoy the park.
• Community Services	Moderate	The area is currently very rough and park supervision and maintenance would be required.
• Perceived Need	Large	Only one small recreation field now available. More recreation area really needed.

SITE: Yellow Mill Channel (continued) PRIMARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	Moderate benefit	Park adjacent to housing will increase its desirability.
• Employment	Moderate benefit	Particularly if money becomes available for local park supervision.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Large benefit	Site will provide excellent recreation opportunities, which are needed.
• Educational Opportunities	Small benefit	Cultural interaction through athletic activities.
• Cultural Resources	None	
• Historical Significance	Negligible	
5. AESTHETICS		
• Noise	Negligible	Park will be one hundred yards or more from nearest residence.
• Odors	Negligible	Top two feet of material will be clean.
• Exposure	Large benefit	Park viewed from all angles--reduction in vandalism may occur due to this.
• Compatibility	Large benefit	Yellow Mill Channel is currently an eye sore. Recreational facilities compatible with adjacent public housing.
• Panoramic View	Moderate benefit	Green recreation fields replace aesthetically unappealing scene.

SITE: YELLOW MILL CHANNEL/BRIDGEPORT HARBOR   SECONDARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	None	
• Construction Hazards	Not applicable	
• Final Use Hazards	Negligible	If site used as athletic fields.
• Traffic Congestion	Negligible	If site used as athletic fields.
• Vectors	Small benefit to area	Will eliminate some habitat for rats.
• Particulates	Negligible	
2. COMMUNITY ORGANIZATION		
• Displacement	None	
• Zoning Compatibility	Small benefit	Adds to regional recreation resources.
• Accessibility	Moderate	If site used as athletic fields.
• Community Services	None	
• Perceived Need	Moderate	Athletic fields can serve entire municipal area, via various athletic leagues, etc.

SITE: Yellow Mill Channel (continued) SECONDARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	
• Employment	Negligible beneficial	
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Moderate beneficial	More recreation capacity needed in urban area.
• Educational Opportunities	Negligible	
• Cultural Resources	Negligible	
• Historical Significance	Negligible	
5. AESTHETICS		
• Noise	None	
• Odors	None	
• Exposure	Negligible	
• Compatibility	Negligible	
• Panoramic View	None	

Yellow Mill Channel

The most potentially significant adverse impacts believed resulting from filling Yellow Mill Channel are associated with displacement of commercial dock facilities. Although current shipping activities in Yellow Mill Channel are not a major portion of total Bridgeport Harbor waterborne commerce, loss of such facilities and conversion to non-marine related activities could be viewed as being contrary to coastal area management objectives over the long term.

Location of Yellow Mill Channel adjacent to high density public housing is related to some adverse impacts during construction, such as construction hazards, noise, and odors.

On the other hand, location of the channel and use of created land for recreational purposes is viewed as a major benefit to the area as recreation space is really needed in this densely populated urban area. Yellow Mill Channel is currently considered an eyesore and a breeding ground for rats--conditions which would be reduced or eliminated by filling and development of green recreation fields.

6.5 Site Cost Analysis

Before discussing the specific cost elements of this containment facility it is useful to consider some of the assumptions and characteristics that are present in the different disposal methods--containment facility land disposal within one mile of the dredging site disposal in Long Island Sound 10 miles from the dredging area and disposal in the open ocean about 100 miles from the dredging location.

Containment Facility

If the dredging site is within two miles of the containment facility it is assumed that hydraulic dredging can occur and the material is transported to the facility through temporary pipeline. If the dredging site is further than two miles it is assumed that clamshell dredging occurs and the material is transported by barge. It is deposited in a small transfer basin at a dike containment facility and then hydraulically pumped to various locations within the facility to fill it. The total cost of disposal of dredged material in the containment facility is computed from the sum of the costs of dredging, transportation construction of the containment facility and operation of the containment facility during disposal of material.

Land Disposal

A critical assumption in this alternative is that land is available within one mile of each of the dredging sites that are included in the service area of a containment facility. This is certainly a very broad assumption given the reality of environmental constraints and social attitudes prevalent in some communities in the Long Island Sound region. However, land disposal, especially for maintenance dredging of rivers and small harbors with clean material and small volumes continues to be a viable economic option. Given the availability of land, hydraulic dredging is then assumed with pipeline transportation of dredged material.

The total cost of land disposal is strongly influenced by assumptions made concerning the possible cost of obtaining the land for use for disposal of dredged material. It is assumed that the land is available for this use at essentially no charge since, presumably after fill and development, the value of the land for sale or other use should be at least what it was initially. The unit cost (dredging transportation and disposal) is always least for land disposal compared with the other alternatives considered. However, if it were assumed that land must be acquired for the purpose of disposal of dredged material and that the purchase price is $30,000 per acre, the land disposal unit cost might be greater than the cost for disposal in a containment facility.

Long Island Sound Disposal

The critical assumption of the alternative method of disposal in Long Island Sound is that a site is available approximately 10 miles from the area of dredging activity. The disposal site is assumed to be an average distance of 10 miles from all dredging sites associated with a particular containment facility. In all cases it is assumed that clamshell dredging occurs and the dredged material is transported to the disposal site by barge. Based on the Statement of Work, for comparative purposes, a unit cost is computed for the dredging and transportation and is, therefore, a fixed value of $4.20/cu yd that will not vary with the dredging associated with different containment facilities.

Open Ocean Disposal

The assumptions for open ocean disposal are similar to those for disposal in Long Island Sound with the exception that the disposal site is assumed to be an average distance of 100 miles offshore from the dredging activity With the assumptions of clamshell dredging and barge transport, a fixed unit cost of $6.60/cu yd is obtained for comparison with costs of other disposal options.

The basic cost factors that are common to all sites and are used in the costing computations are given in Table 6-2. These cost factors are discussed in Section 11.

In addition to these basic cost factors there are a number of site specific characteristics that significantly affect the total and unit costs associated with a given prototype containment facility.

TABLE 6-2

COST FACTORS USED IN COMPUTATIONS

Operation	Cost
Hydraulic Dredging	$ 1.00/cu yd
Clamshell Dredging	$ 1.50/cu yd
Barge Transportation to 10 Miles	$ 2.70/cu yd
Barge Transportation to 100 Miles	$ 5.10/cu yd
Temporary Pipeline Transportation	$ 0.325 mil /mile*
Open Water Dike Construction	Cost/mile = $(1.5\ H^2 + 10H)\ \$2374 + K_1HT_1 + K_2HT_2$
Sheltered Water Dike Construction (Beach)	Cost/mile = $(1.0H^2 + 10H)\ \$2347 + K_2HT_1 + K_2HT_2$, where T_2 = sheltered riprap thickness (ft), K_2 = \$6914 and $K_1 = \begin{cases} \$\ 10{,}932, & T_1 = 1\text{-}2\text{ ft} \\ \$\ 52{,}565 & T_1 = 4\text{ ft.} \end{cases}$
Containment Facility Operation	$ 50,000/year
Acquisition of Land for Land Disposal	Nothing or $ 30,000/acre
Construction and Operation of Land Disposal	$ 0.50/cu yd

*This represents a 30% increase over the usual cost of $0.25 mil/mile to reflect the requirements of a booster pump for the 3-mile transportation distance.

Table 6-3 presents the pertinent overall physical characteristics of the containment facility (dike length and height and containment facility area and capacity) as well as the time period estimated for filling the facility and the source of dredged materials. Additional special characteristics are noted. In the case of the prototype containment facility at Yellow Mill Channel the cost of construction computed according to Table 6-1 was increased by $500,000 to address potential problems associated with the re-routing of seven storm drains and an upstream source. Clearly, detailed Stage 3 engineering studies will be required to more carefully estimate the potential cost of extending storm drains. If it is assumed that several years worth of material from deferred maintenance dredging is immediately available, the period for filling the containment facility might be only two years rather than the five years indicated in Table 6-2.

TABLE 6-3

YELLOW MILL CHANNEL CONTAINMENT FACILITY CHARACTERISTICS

Item	Units	Hydraulic Dredging Scenario
Containment Facility Dike Length	ft	500
Containment Facility Dike Height	ft	25
Containment Facility Exposed Surface Slope	--	1:1
Containment Facility Riprap Thickness or Exposed Surface	ft	1
Containment Facility Area	acres	16.5
Containment Facility Capacity	cu yd	500,000
Period of Disposal	yr	5
Source and Amount of Dredged Material	cu yd	
Bridgeport (1 mile)		500,000
Total Dredged Material	*cu yd*	500,000

Special Remarks: The cost of construction of the containment facility was increased by $500,000 to allow rerouting of 7 storm sewers and the upstream source. A rubble mound 1:1 dike construction is assumed.

A comparison of the total cost and unit costs obtained for each disposal alternative is given in Table 6-4. Cost analysis indicates the most economic method of disposing of dredged material from Bridgeport harbor to be land disposal. This conclusion, however, is dependent on the availability of land at no cost within one mile of dredging, which may not be possible. Approximately 31 acres would be needed assuming an average fill depth of 10 feet.

TABLE 6-4

COMPARISON OF COSTS OF ALTERNATIVE METHODS OF DISPOSAL WITH DISPOSAL AT YELLOW MILL CHANNEL CONTAINMENT FACILITY

Disposal Method	Dredging Method	Transport Method	Costs ($ Millions)					Unit Cost ($/cu yd)
			Dredging	Transport	Construct.	Disposal	Total	
Containment Facility	1. Hydraulic 2. Clamshell 3. Hydraulic (%) Clamshell (%)	Pipe (1 mi) Barge (mi) Pipe (mi) Barge (mi)	0.500	0.250	0.727*	0.250	1.727	3.45
Land	4. Hydraulic	Pipe (1 mi)	0.500	0.250	-	0.250	1.000	2.00
Long Island Sound	5. Clamshell	Barge (10 mi)	0.750	1.350	-	-	2.100	4.20
Ocean	6. Clamshell	Barge (100 mi)	0.750	2.550	-	-	3.300	6.60

*Includes 0.5 million dollars for rerouting of 7 storm sewers and the upstream source.

If a $30,000/acre cost of land acquisition is assumed, the unit cost of land disposal would be $3.86/cu yd rather than the $2.00/cu yd computed under the assumption of no-cost land availability. With this assumption, land disposal would be less economical than disposal in the proposed containment facility

The unit cost of disposal at the Yellow Mill Channel Containment Facility is $3.45/cu yd. This is considerably less than the unit cost for disposal in Long Island Sound and only a little more than half the cost of open ocean disposal. It must be kept in mind, however, that with the availability of dredged material close to the containment facility, allowing hydraulic dredging and short distance pipeline transportation of material, the controlling element of the cost analysis is the construction of the containment facility in Yellow Mill Channel. Cost of construction of the dike and filling the facility accounts for 28 percent of the total cost under the assumptions

cited. The assumed cost of rerouting the storm drains is 29 percent of the total containment facility cost. Therefore, if the costs of storm drain rerouting are much higher (or lower) than assumed, the unit cost of \$3.45/cu yd would change appreciably. If the period of disposal was assumed to be two years rather than five years, the unit cost would decrease to \$3.15/cu yd.

6.6 Summary

The one-half million cu yd containment facility in the upper 1400 ft of Yellow Mill Channel will be created by a 500-ft long dike having an elevation of 25 ft. The dike will be faced with one foot of riprap on a 1:1 slope. The 16.5 acre facility would have an expected final use as recreation fields for use by the inhabitants of the densely populated surrounding area. Federal assistance likely would be required to provide adequate funds for the equipping of the recreation area. Filling the upper portion of Yellow Mill Channel would eliminate a rat habitat and remove the continued risk of occasional drownings. The concept of filling the upper end of Yellow Mill Channel and making the area available for recreation has strong support from Bridgeport agencies. The most adverse potential impact is the possibility of interfering with barge access to D'Addario Sand and Gravel and the Jacobs Brothers' metal company. An effort will be made to mitigate these effects through suitable dike location and construction

There will be no dike construction, dredging or material placement during the months of June, July, August and September; and no night work is anticipated at any time. The dike would be constructed in March, April and May of the first year; filling could begin in the Fall of the first year and could continue for two or more years. The dike will require only 16,000 cu yd of impervious material transported by truck from inland borrow pits.

The unit cost of disposal at the Yellow Mill Channel prototype dredged material containment facility is $3.45/cu yd, which is less than either disposal in Long Island Sound ($4.20/cu yd) or open ocean disposal ($6.60/cu yd). However, land disposal is the most economical disposal method at $2 00/cu yd **if** it is assumed that land for fill is available at no cost within 1 mile of all dredging no dikes or water treatment are required, and hydraulic dredging is carried out with transport of the dredged material by temporary pipeline to the disposal site. The unit cost for containment facility disposal is dependent on the assumption of all fill material coming from Bridgeport Harbor with only hydraulic dredging occurring and temporary pipeline transportation of dredged material. The unit cost is also affected by the need to extend several storm drains that now empty into the upper reaches of Yellow Mill Channel.

6.7 References

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7.0 SITE ANALYSIS #3: MORRIS COVE/NEW HAVEN HARBOR

7.1 Introduction

This section presents the detailed results of the analysis of social and economic impacts associated with the construction and final use of a prototype dredged material containment facility at Morris Cove in New Haven Harbor. Short-term impacts during filling with dredged material and final capping have been examined, as well as long-term impacts involving final use.

The background material essential for assessing impacts is summarized in Section 7.2. A scenario for the filling and completion of the containment facility is given in Section 7.3. The short-term and long-term socioeconomic impacts are presented and evaluated in Section 7.4. The cost analysis is given in Section 7.5 and a summary of the most pertinent results is given in Section 7.6.

7.2 Background

New Haven Harbor is located in the south central Connecticut region which includes 36 cities and towns, the largest being the city of New Haven. The most significant natural resource in the region is the irregular coastline which provides many good beaches and sheltered coves for a variety of recreational activities such as fishing, swimming water skiing, and pleasure boating (1).* In the Greater New Haven area, of the 100,000 non-government employees (1974 statistics), 77 percent are in manufacturing 6 percent are employed by utilities, 3 percent by the railroad, 5 percent by hospitals, and 9 percent by colleges and universities (1). The major highways serving the area are the Connecticut Turnpike (I-95) and U.S. Route 1 along the coast and Route 15 and I-91 that provide access inland to the north. Major rail service is along two routes--one between New York and Boston through New Haven, New London and Providence, and a second route from New Haven through Hartford and Springfield.

New Haven Harbor handled 50 percent of Connecticut's waterborne commerce in 1977 (2). Almost 80 percent of this was petroleum products. Half of the 17 million tons of petroleum products entering the state by water pass through New Haven Harbor; 2.3 million tons of general cargo are also handled through New Haven--a sizable portion is scrap metal which is exported worldwide. Other commodities include lumber, building cement, basic chemicals, and iron and steel sheets, plates, shaped pipes and tubes.

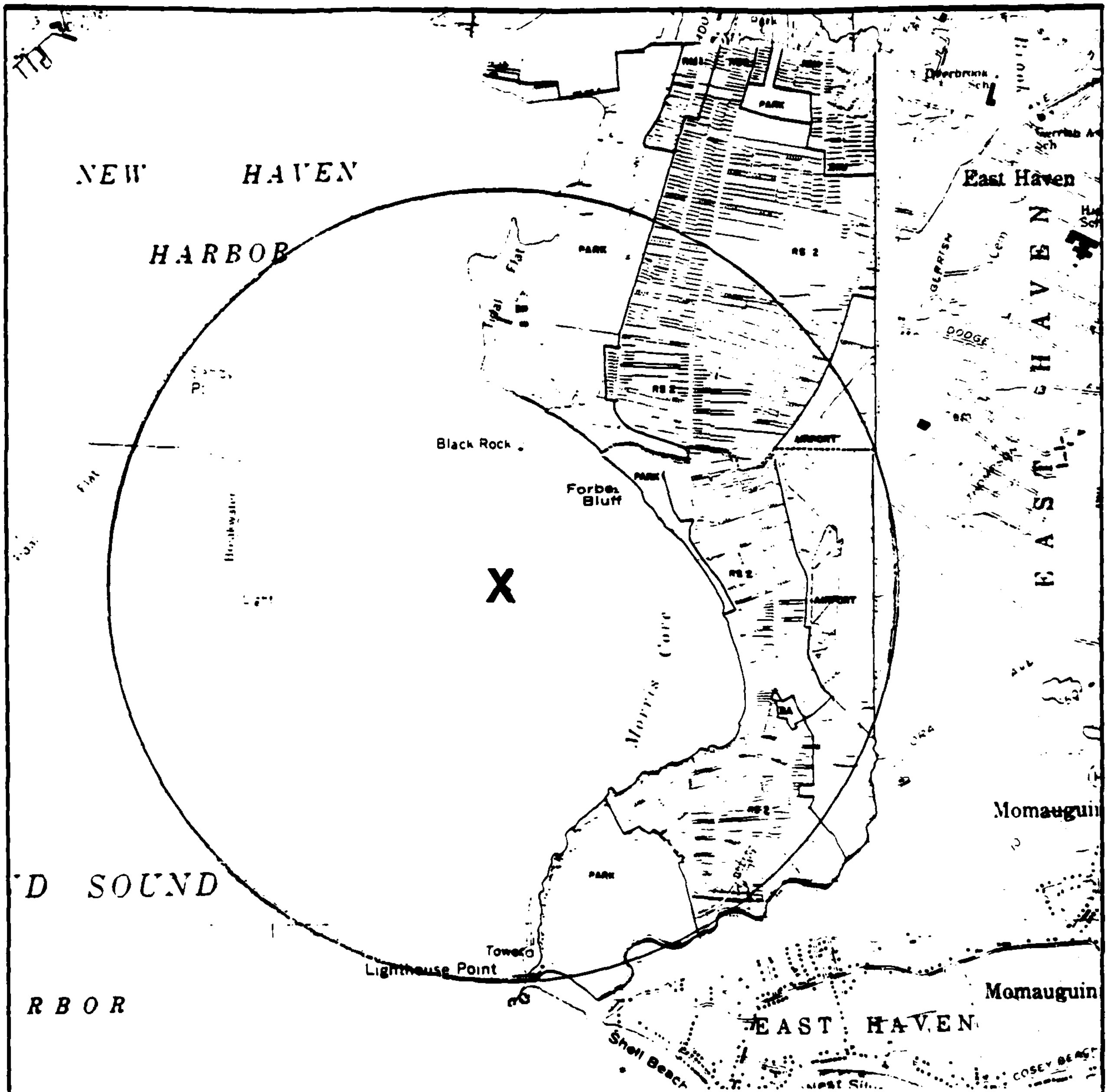
*Numbers refer to references at the end of this section.

Waterfront facilities for deep-draft vessels are located along the north and east sides of the inner portion of New Haven Harbor (3). Facilities for smaller vessels and barges are along the sides of the harbor and also in the Mill, Quinnipiac and West Rivers.

There are a total of 42 piers, wharfs and docks for New Haven Harbor; 38 are located in New Haven and 4 are in West Haven (3). Two of the waterfront facilities handle general cargo in the foreign and domestic trades, and one receives petroleum products and chemicals. Fifteen facilities receive and/or ship petroleum products; one receives sulphuric acid by barge; one receives bulk cement; two receive oysters and oyster shells. One facility is used for repairing small vessels; five for mooring fishing boats, small vessels and floating equipment; and 17 were not used at the time of survey.

Recreational boating in New Haven Harbor is of secondary importance compared to commercial/industrial activities. There are a dozen marinas and yacht clubs operating in New Haven Harbor (4,5). A majority of the marinas are at full utilization. The most typical boats accommodated are power boats in the 24-35 ft range. Including the unspecified available anchorage at the yacht clubs there are well over 1000 slips and moorings in the New Haven Harbor area. in about 43 acres of total anchorage space.

The area within one mile of the prototype DMCF is primarily residential and park lands as shown on the zoning map (Figure 7-1). The southern half of East Shore Park is within 1 mile to the north. The section of Brightview in New Haven including the Nathan Hale School lies to the northeast, and further to the east, adjacent to Morris Cove, is Tweed-New Haven Airport. The Morris Cove section of New Haven is southeast of the protype containment facility location. Lighthouse Point Park and Lighthouse Point are found to the south of the proposed facility. Shellfish are located near the perimeter of the borrow pit site.



LEGEND

X - Approximate center of containment site.

RS2 - Residential   RM1 - Residential

BA - Commercial

0 ——— 1 mile

MORRIS COVE SITE

Figure 7-1. Zoning map for Morris Cove site.

7.3 Morris Cove Scenario

The objective of the Morris Cove/New Haven Harbor containment facility is to make use of a borrow pit in the cove, which was created during the construction of I-95. The borrow pit has a capacity of about 900,000 cu yd, having approximate dimensions of 2400 x 600 x 25 ft. The proposed location of the prototype containment facility is shown in Figure 7-2.

When completely filled the surface of the containment facility would be about 10 ft below Mean Low Water, essentially the same as the surrounding bottom area. Thus, none of the dredge material will be exposed to view or to air. The upper 2 ft will be clean material, making this 33-acre site suitable as a shellfish area.

The site could be filled entirely by New Haven Harbor material removed by hydraulic dredge and transported by floating pipeline. Or, it could also receive some dredged material extracted by clamshell and barged to the site. All dredging and filling would take place during the months of March, April and May, or October and November, to avoid the shellfish and heavy recreation seasons Work will nominally occur only on week days during daylight hours. It is anticipated that the site could be filled within one or two years, i.e., two to four working seasons.

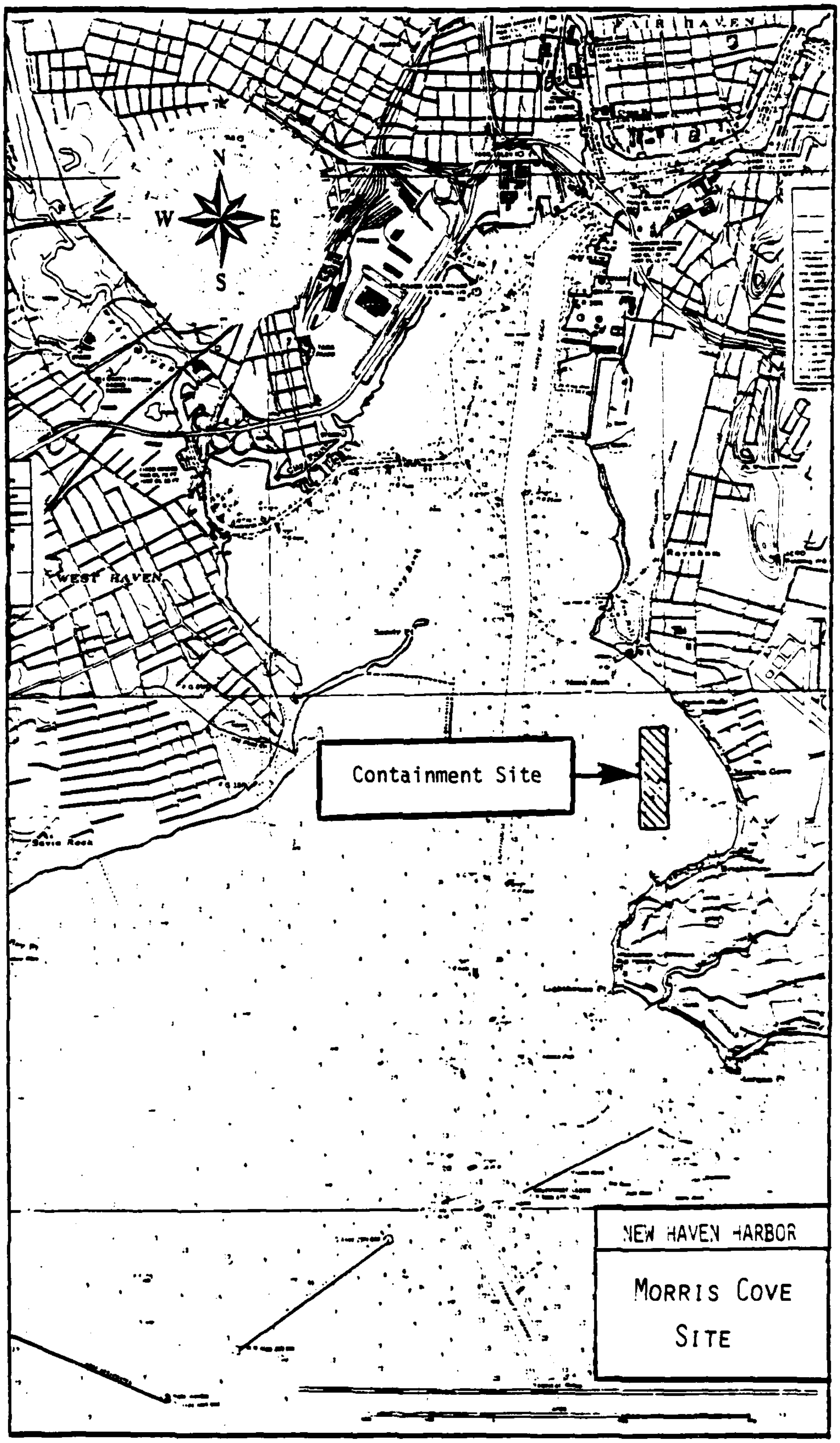


Figure 7-2. Proposed location of prototype dredged material containment facility.

7.4 Social and Economic Impact Analysis

Background

In undertaking Work Order No. 8 for NED/CE, CEM staff performed the analysis of potential impacts in four steps:

1. Review and analysis of 49 dredging/disposal permits issued by NED/CE for Connecticut projects in 1979 and 1980, including:
   - o Agency and general public objections.
   - o Mitigating measures incorporated by the applicant in a revised permit application in response to formal objections and informal "suggestions" by agencies and the general public.
   - o Special conditions in the permits imposed by NED/CE in response to objections, "suggestions," and/or NED/CE policy.
2. Review of the literature and selection of social, environmental, and economic attributes to be considered, including preparation of preliminary descriptions of each site.
3. On-site personal interviews and telephone contacts with opinion leaders and others to determine on-site public attitudes, and review of NED/CE workshop responses.
4. Preparation of more detailed scenarios for each containment facility, and subjective potential impact evaluation by CEM staff.

The results of the first step are presented in Section 4 of this report. The literature reviewed is cited in Appendix A. Summaries of personal interviews and telephone contacts are given in Appendix B. Appendix E summarizes the written responses to four NED/CE workshops held in May 1981 at New London, New Haven and Stamford, Connecticut, and Great Neck on Long Island.

Preliminary location maps were prepared for each facility, prior to conducting the public attitude survey. Discussions were held with NED/CE staff, based on preliminary results of the public attitude survey and cost analysis, and the more detailed scenarios were developed (see Section 7.3 above), taking into account many of the comments derived from the public attitude analysis and workshop responses.

Concurrent with the above work, CEM reviewed the literature on social, economic and environmental impact assessment. Using various sources, especially the Water Resources Assessment Methodology (WRAM) developed by the Corps of Engineers, and the Site Evaluation of Energy Conversion Systems (SELECS) methodology developed by CEM for the Department of Energy, five categories of impacts involving 22 attributes were chosen as being most appropriate for this social and impact analysis (6,7,8,9). Table 7-1 provides definitions of the 22 impact attributes.

TABLE 7-1

DEFINITIONS OF 22 IMPACT ATTRIBUTES

Category 1: LIFE, HEALTH, SAFETY

1. Boating Hazards: Those created by barges and support vessels during construction; and those due to containment areas.
2. Construction Hazards: Injuries to workers or to (illegal) visitors during dike building or during placing and grading dredged materials.
3. Final Use Hazards: Creating new land also creates a potential for more accidents as more people visit the site.
4. Traffic Congestion: The number of additional vehicles used during construction and final use is added to the number already present in the primary impact area.
5. Vectors (organisms which can carry and transmit disease): Norway rats and mosquitos are of concern.
6. Air Pollution: Particulate matter--especially dust from movement of dredged material that has been partially dewatered--is the principal pollutant to measure. Exhaust gases from various machines are also considered.

Category 2: COMMUNITY ORGANIZATION

7. Displacement of People: Need for road access during site construction may force relocation. Fishermen, and other commercial, industrial and recreational interests may suffer.
8. Zoning Compatibility: Final use of the site must agree with zoning regulations of the adjacent region. Potential for zoning waivers are considered.
9. Accessibility: Both physical (road access, elevated structures) and psychological (attractiveness of site) are considered.
10. Community Service: Increases in need and use of service personnel such as police, fire and maintenance persons.
11. Perceived Need for a Particular Final Use: What community persons feel and say about what their community needs or lacks the most.

Category 3: FINANCIAL

12. Land Value: Price of property surrounding or near a containment area may be affected, this will be considered.
13. Employment: The number of new jobs created by construction or by final use will be compared to those who are unemployed and are looking for jobs.

Category 4: EDUCATIONAL, CULTURAL, RECREATIONAL

14. Recreational Opportunities: Community population in relation to per capita recreational opportunity will be considered.
15. Educational Opportunities: Community size, number of projected visitors to the site, size of the site and "general educational enthusiasm" will be considered.
16. Proximity of a Cultural Resource: Are there theaters, museums, aquariums, universities or other landmarks close to the site?
17. Historical Significance: Sites in or similar to those in the *National Register of Historic Places* will be identified.

Category 5: AESTHETICS

18. Noise: Machinery used during construction and operation may add, temporarily, to noise level near the site.
19. Odors: Dredged material may contain sediments with organic composition that create odors dispersed by wind. The number of people in the primary impact area is of concern.
20. Exposure: This involves the number of people in in a community who might view and be visually affected by the containment area.
21. Compatibility: How does the proposed site fit in with what is around it? (This goes beyond the question of legal zoning requirements.)
22. Reduction in Panoramic View: Both the dike and the necessary operation equipment may interfere with the opportunities offered by shorelines for wide, unobstructed views.

The remainder of this section contains some of the more significant perceived impacts extracted from the public attitude survey and a subjective preliminary assessment of potential impacts. Because there were differences between the preliminary scenario used in the attitude survey and the more detailed scenario given in Section 7.3, many of the perceived impacts have parenthetical clarifying statements following them. Following next is an eight-page summary of the subjective impact analysis prepared by CEM staff, using the 22 impact attributes.

Perceived Major Social, Economic, and Environmental Impacts

CEM staff visited proposed dredged material containment facility sites and interviewed pertinent persons such as first selectmen (i.e., mayors), harbor masters, marina operators, and other opinion leaders. In some instances, telephone interviews with other relevant persons were also accomplished.

Many of those interviewed were acquainted with a list of 22 potential impact attributes compiled by CEM. They were provided with a preliminary estiamte of the size and other characteristics of the proposed containment facility, but not the detailed scenario presented above, which was prepared after the first phase of this economic and social impact analysis was completed, and includes mitigating measures suggested by NED/CE. The more significant perceived impacts extracted from the public opinion survey are presented next.

The following summarizes the major impacts extracted from personal and telephone interviews. Clarifying comments responding to some of the perceived major impacts are included parenthetically.

- o Dredged material disposal should not take place at night or during the summer although night dredged material disposal would be acceptable if the noise level on shore did not exceed about 60 decibels. (No night work is anticipated.)
- o There may be loss of some shellfish on the perimeter of the site. (When dredged material placement is completed, the area--if properly designed and constructed—could add to the shellfish habitat.)

Results of Subjective Analysis of Potential Impacts

In arriving at subjective judgments concerning the level of potential impacts that might stem from implementation of this prototype dredged material containment facility, consideration was given to short-term impacts associated with the construction, filling, capping and final shaping and seeding of the containment facility, and to long-term impacts that would occur after the facility is completed and is in use. Impacts were assigned both for the primary region within one-mile radius of the facility, and in the secondary impact region of one to five miles radius about the site. Recent low altitude aerial color photography of the site and its surrounding region, as well as maps, personal ground visits and results of personal interviews and telephone contacts, were used as aids in the final process of arriving at judgmental decisions for the level of impacts that may occur.

The impact analysis occurred in three phases. First, a preliminary assessment was made, based on the public attitude response to the preliminary scenario, which described only the physical characteristics of the tentatively conceived prototype containment facility. The preliminary assessment was communicated to NED/CE, along with a more detailed draft scenario that included mitigating measures responsive to many of the significant potential impacts perceived by the public. The scenario presented in the section above was coordinated with NED/CE and then used along with all other pertinent information and data as a basis for the potential impact assessment presented in the following tabular form.

It is emphasized that detailed design, geological and benthic field tests, an environmental impact statement, and a series of public meetings will be accomplished before implementation can begin. It is also important to note that Congress must review and appropriate funds for each project. Thus, many of the potential impacts described here may be subject to further mitigating measures before implementation of a prototype dredged material project begins.

Morris Cove Site

The Morris Cove site is considered to have minimal adverse socioeconomic impacts associated with filling of an abandoned underwater borrow pit. An oyster bed located on the perimeter of the borrow pit may be disturbed. Location of the disposal site away from shore and underwater avoids adverse impacts, odors, visual aesthetics, noise, etc., sometimes associated with DMCF developments.

Over the long term, filling of the borrow pit may be beneficial as the completed site would provide additional habitat for shellfish and revenues generated therefrom.

SITE: MORRIS COVE/NEW HAVEN HARBOR PRIMARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Small	The floating pipeline is the principal hazard to which commercial fishing and some recreational boating will be exposed. No summer dredging.
• Construction Hazards	None	Site is under water, with no dike constructed.
• Final Use Hazards	Not applicable Short-term	
• Traffic Congestion	None	
• Vectors	None	
• Particulates	None	
2. COMMUNITY ORGANIZATION		
• Displacement	Small	Oysters on perimeter of site.
• Zoning Compatibility	Not applicable Short-term	
• Accessibility	None	
• Community Services	None	
• Perceived Need	Not applicable Short-term	

SITE: Morris Cove (continued) PRIMARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	
• Employment	None	
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	None	
• Educational Opportunities	None	
• Cultural Resources	None	
• Historical Significance	None	
5. AESTHETICS		
• Noise	Negligible	No trucks; machinery far enough away.
• Odors	None	
• Exposure	None	
• Compatibility	None	
• Panoramic View	None	

SITE: MORRIS COVE/NEW HAVEN HARBOR | SECONDARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Negligible	
• Construction Hazards	Negligible	Dredged material to be deposited underwater.
• Final Use Hazards	Not applicable Short-term	
• Traffic Congestion	None	No trucks required.
• Vectors	None	Site is underwater, no new land created.
• Particulates	None	Site is underwater.
2. COMMUNITY ORGANIZATION		
• Displacement	None	
• Zoning Compatibility	Not applicable Short-term	Site is underwater.
• Accessibility	Negligible	
• Community Services	None	No expected change to be required for this impact area.
• Perceived Need	Negligible	No strong sentiment community-wide to fill in the site.

SITE: Morris Cove (continued) SECONDARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	Site underwater, therefore no effect on attribute.
• Employment	None	
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Negligible	Dredging and disposal activities scheduled for non-recreational seasons.
• Educational Opportunities	None	
• Cultural Resources	None	
• Historical Significance	None	
5. AESTHETICS		
• Noise	Negligible	Project may be heard, but noise not expected to be loud (less than 70 db).
• Odors	None	
• Exposure	Negligible	Relatively few vantage points.
• Compatibility	Negligible	Obtrusive character of machinery reduced by distance.
• Panoramic View	None	

SITE: MORRIS COVE/NEW HAVEN HARBOR PRIMARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	None	Site is underwater to a depth of about 10 ft at MLW.
• Construction Hazards	Not applicable Long-term	
• Final Use Hazards	None	Site is underwater.
• Traffic Congestion	None	Same as above.
• Vectors	None	Same as above.
• Particulates	None	Same as above.
2. COMMUNITY ORGANIZATION		
• Displacement	Moderate benefit	The site can be used for shellfish.
• Zoning Compatibility	None	Site is underwater.
• Accessibility	None	Same as above.
• Community Services	None	Same as above.
• Perceived Need	Negligible	Same as above.

SITE: Morris Cove (continued) PRIMARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	Site is underwater.
• Employment	Moderate benefit	Particularly if a plan to expand Long Wharf for fishermen is implemented.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Negligible benefit	Scuba diving to observe the site is possible.
• Educational Opportunities	Negligible benefit	Same as above.
• Cultural Resources	None	None known within one mile.
• Historical Significance	None	None known within one mile.
5. AESTHETICS		
• Noise	None	Site is under water.
• Odors	None	Same as above.
• Exposure	None	Same as above.
• Compatibility	None	Same as above.
• Panoramic View	None	Same as above.

SITE: MORRIS COVE/NEW HAVEN HARBOR SECONDARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	None	
• Construction Hazards	Not applicable	
• Final Use Hazards	None	
• Traffic Congestion	None	
• Vectors	None	
• Particulates	None	
2. COMMUNITY ORGANIZATION		
• Displacement	None	
• Zoning Compatibility	None	
• Accessibility	None	
• Community Services	None	
• Perceived Need	Not Applicable	

SITE: Morris Cove (continued) SECONDARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	
• Employment	Negligible beneficial	May increase available shell-fish area.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	None	
• Educational Opportunities	None	
• Cultural Resources	None	
• Historical Significance	None	
5. AESTHETICS		
• Noise	None	
• Odors	None	
• Exposure	None	
• Compatibility	None	
• Panoramic View	None	View of water surface will not change.

7.5 Site Cost Analysis

Before discussing the specific cost elements of this containment facility it is useful to consider some of the assumptions and characteristics that are present in the different disposal methods--containment facility, land disposal within one mile of the dredging site, disposal in Long Island Sound 10 miles from the dredging area and disposal in the open ocean about 100 miles from the dredging location.

Containment Facility

If the dredging site is within two miles of the containment facility, it is assumed that hydraulic dredging can occur and the material is transported to the facility through temporary pipeline. Usually, if the dredging site is further than two miles, it is assumed that clamshell dredging occurs and the material is transported by barge. For most facilities, the dredged material is deposited in a small transfer basin at a dike containment facility and then hydraulically pumped to various locations within the facility to fill it. In the case of the Morris Cove facility, when hydraulic dredging occurs, the material is pumped directly to the borrow pit. The total cost of disposal of dredged material in the containment facility is computed from the sum of the costs of dredging and pipeline transport of material.

Land Disposal

A critical assumption in this alternative is that land is available within one mile of each of the dredging sites that are included in the service area of a containment facility. This is certainly a questionable assumption given the reality of environmental constraints and social attitudes prevalent in some communities in the Long Island Sound region. However, land disposal, especially for maintenance dredging of rivers and small harbors with clean material and small volumes, continues to be a viable economic option. Given the availability of land, hydraulic dredging is then assumed with pipeline transportation of dredged material.

The total cost of land disposal is strongly influenced by assumptions made concerning the possible cost of obtaining the land for use for disposal of dredged material. It is assumed that the land is available for this use at essentially no charge since, presumably after fill and development, the value of the land for sale or other use should be at least what it was initially. The unit cost (dredging, transportation and disposal) is always least for land disposal compared with the other alternatives considered. However, if it were assumed that land must be acquired for the purpose of disposal of dredged material and that the purchase price is $30,000 per acre, the land disposal unit cost might be greater than the cost for disposal in a containment facility.

Long Island Sound Disposal

The critical assumption of the alternative method of disposal in Long Island Sound is that a site is available approximately 10 miles from the area of dredging activity. The disposal site is assumed to be an average distance of 10 miles from all dredging sites associated with a particular containment facility. In all cases it is assumed that clamshell dredging occurs and the dredged material is transported to the disposal site by barge. Based on the Statement of Work, for comparative purposes, a unit cost is computed for the dredging and transportation and is, therefore, a fixed value of $4.20/cu yd that will not vary with the dredging associated with different containment facilities.

Open Ocean Disposal

The assumptions for open ocean disposal are similar to those for disposal in Long Island Sound with the exception that the disposal site is assumed to be an average distance of 100 miles offshore from the dredging activity. With the assumptions of clamshell dredging and barge transport, a fixed unit cost of $6.60/cu yd is obtained for comparison with costs of other disposal options.

The basic cost factors that are common to all sites and are used in the costing computations are given in Table 7-2. These cost factors are discussed in Section 11.0.

In addition to these basic cost factors there are a number of site specific characteristics that significantly affect the total and unit costs associated with a given prototype containment facility.

TABLE 7-2

COST FACTORS USED IN COMPUTATIONS

Operation	Cost
Hydraulic Dredging	$ 1.00/cu yd
Clamshell Dredging	$ 1.50/cu yd
Barge Transportation to 10 Miles	$ 2.70/cu yd
Barge Transportation to 100 Miles	$ 5.10/cu yd
Temporary Pipeline Transportation	$ 0.325 mil /mile*
Open Water Dike Construction	Cost/mile = $(1.5\,H^2 + 10H)\,\$2374 + K_1HT_1 + K_2HT_2$
Sheltered Water Dike Construction (Beach)	Cost/mile = $(1.0H^2 + 10H)\,\$2347 + K_2HT_1 + K_2HT_2$, where T_2 = sheltered riprap thickness (ft), K_2 = \$6914 and $K_1 = \begin{cases} \$\,10{,}932, & T_1 = 1\text{-}2\text{ ft} \\ \$\,52{,}565 & T_1 = 4\text{ ft.} \end{cases}$
Containment Facility Operation	$ 50,000/year
Acquisition of Land for Land Disposal	Nothing or $ 30,000/acre
Construction and Operation of Land Disposal	$ 0.50/cu yd

*This represents a 30% increase over the usual cost of $0.25 mil/mile to reflect the requirements of a booster pump for the 3-mile transportation distance.

Table 7-3 presents the pertinent overall physical characteristics of the containment facility (containment facility area and capacity) as well as the time period estimated for filling the facility and the source of dredged materials. Additional special characteristics are noted. In the case of the prototype containment facility at Morris Cove, there is no dike construction because the dredged material is to be deposited in a borrow pit in the cove. Only dredged material available locally from New Haven Harbor is to be used in filling the borrow pit over a period of three years.

TABLE 7-3

MORRIS COVE CONTAINMENT FACILITY CHARACTERISTICS

Item	Units	Hydraulic and Clamshell Dredging Scenario
Containment Facility Dike Length	ft	-
Containment Facility Dike Height	ft	-
Containment Facility Exposed Surface Slope	--	-
Containment Facility Riprap Thickness or Exposed Surface	ft	-
Containment Facility Area	acres	33
Containment Facility Capacity	cu yd	900,000
Period of Disposal	yr	3
Source and Amount of Dredged Material	cu yd	
New Haven Harbor (2 miles)		900,000
Total Dredged Material	cu yd	900,000
Special Remarks: There is no dike construction.		

A comparison of the total cost and unit costs obtained for each disposal alternative is given in Table 7-4. Cost analysis indicates the most economical method of disposing of dredged material from New Haven Harbor to be either land disposal or hydraulic dredging disposal in the Morris Cove containment facility. The land disposal alternative is dependent on the availability of land at no cost within one mile of dredging, which may not be possible. Approximately 56 acres would be needed assuming an average fill depth of 10 feet.

TABLE 7-4

COMPARISON OF COSTS OF ALTERNATIVE METHODS OF DISPOSAL
WITH DISPOSAL AT MORRIS COVE CONTAINMENT FACILITY

Disposal Method	Dredging Method	Transport Method	Costs ($ Millions)					Unit Cost ($/cu yd)
			Dredging	Transport	Construct.	Disposal	Total	
Containment Facility	1. Hydraulic	Pipe (2 mi)	0.900	0.500	-	0.150	1.550	1.72
	2. Clamshell	Barge (2 mi)	1.350	1.215*	-	0.150	2.715	3.02
	3. Hydraulic (60 %)	Pipe (2 mi)	0.540	0.500	-	0.150	2.216	2.46
	Clamshell (40 %)	Barge (2 mi)	0.540	0.486*	-			
Land	4. Hydraulic	Pipe (1 mi)	0.900	0.250	-	0.450	1.600	1.78
Long Island Sound	5. Clamshell	Barge (10 mi)	1.350	2.430	-	-	3.780	4.20
Ocean	6. Clamshell	Barge (100 mi)	1.350	4.590	-	-	5.940	6.60

*Cost of barge transportation computed at $1.35/cu yd for distance of 2 miles or less.

If a $30,000/acre cost of land acquisition is assumed, the unit cost of land disposal would be $3.66/cu yd rather than the $1.78/cu yd computed under the assumption of no-cost land availability. With this assumption, land disposal would be less economical than disposal in the proposed containment facility.

The unit cost of disposal at the Morris Cove Containment Facility is only $1.72/cu yd when all dredging is hydraulic. This is less than half the unit cost for disposal in Long Island Sound and less than one-third the cost of open ocean disposal. It must be kept in mind, however, that the availability of dredged material close to the containment facility, allowing hydraulic dredging and short distance pipeline transportation of material is the controlling element of the cost analysis. The assumption is

made that all maintenance and private dredging is done hydraulically and transported by pipeline for disposal at Morris Cove. However, because of constraints of navigation, pipeline transportation of dredged material from the western portions of the north-south main channel might be difficult to accomplish. If it is assumed that clamshell dredging with barge transportation is used either partially or completely in place of hydraulic dredging, the unit costs go up. The unit costs, however, remain considerably lower than those incurred for disposal in Long Island Sound or in the open ocean.

7.6 Summary

The 0.9 million cu yd containment facility at Morris Cove in southeastern New Haven Harbor results from filling a borrow pit having approximate dimensions of 2400 x 600 x 25 ft and capping with clean material. The 33-acre site would probably be suitable as a shellfish area. The most significant adverse impact will be the disturbance of shellfish adjacent to the site during placement of material.

There will be no dike construction. Dredging or material placement will not occur during the months of June, July, August and September; and no night work is anticipated at any time. Filling the borrow pit would occur in the Spring and Fall and would continue for about two years. The site could be filled entirely by New Haven Harbor material either from hydraulic or clamshell dredging or a combination of the two.

The unit cost of disposal at the Morris Cove dredged material containment facility is $1.72/cu yd with hydraulic dredging and the unit cost for landfill is $1.78/cu yd. Disposal in the Morris Cove containment facility and land disposal are the most economical disposal methods. It is assumed that land for landfill is available at no cost within one mile of all dredging, no dikes or water treatment are required, and hydraulic dredging is carried out with transport of the dredged material by temporary pipeline to the disposal site. These costs are less than either disposal in Long Island Sound ($4.20/cu yd) or open ocean disposal ($6.60/cu yd). The unit cost for containment facility disposal is dependent on the assumption that all fill material comes from local dredging. If clamshell dredging with transport by barge is carried out, the unit cost at the Morris Cove containment facility increases to $3.02/cu yd, which is still less than disposal in Long Island Sound. In general, the concept of using existing nearshore borrow pits for dredged material disposal appears to offer dredged material disposal opportunities that are both low in adverse impact and high in economic savings.

7.7 References

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8.0 SITE ANALYSIS #4: CLINTON HARBOR

8.1 Introduction

This section presents the detailed results of the analysis of social and economic impacts associated with the construction and final use of a prototype dredged material containment facility at Clinton Harbor. Short-term impacts during construction of dikes, filling with dredged material, dewatering, and final capping, contouring, and planting have been examined, as well as long-term impacts involving final use.

The background material essential for assessing impacts is summarized in Section 8.2. A scenario for the construction, filling and completion of the containment facility is given in Section 8.3. The short-term and long-term socioeconomic impacts are presented and evaluated in Section 8.4. The cost analysis is given in Section 8.5 and an summary of the most pertinent results is given in Section 8.6.

8.2 Background

Clinton is located on the central Connecticut shoreline and is surrounded by the shoreline communities of Madison to the west and Westbrook to the east. The town of Clinton encompasses a 16.3 square mile area. The 1980 population was 11,195 persons, with a population density of 687.1 persons per square mile (1).*

Clinton can be characterized as primarily a seasonal and suburban community. This is a change from its rural character of 10 to 20 years ago, due to increased residential growth. Dwelling units increased 13.6 percent from 1970 to 1978. Over the next twenty years, Clinton's expanding employment base, its reasonable commuting location within the New Haven metropolitan area and its desirable environment suggest there will be a need for at least 950 additional housing units by 1995 (3). As of 1980, 4632 dwelling units were located in Clinton (1). Access to Clinton is via Route I-95, Route 81 and Route 1. A total of 7816 taxable vehicles were registered in Clinton in 1977 (3). In 1978-1979, Clinton had a tax rate of 45.5 mills and a total grand list in 1977 of $95,640,909. The mean per capita money income in 1975 was $4,962.

In 1978, about 3040 persons were employed in non-agricultural and manufacturing activities with about 65 percent of the resident labor force commuting outside of town to their jobs. About 16 manufacturing operations are located in Clinton (Directory of New England Manufacturers, 1980) with the largest being Chesebrough-Ponds, Inc., which manufactures pharmaceuticals and cosmetics and employs 1450 persons. The remaining manufacturers generally employ less than 100 persons and

*Numbers refer to references at the end of this section.

produce a variety of products. Approximately 75 acres of land is now in industrial use with about 230 vacant acres of suitable/accessible land zoned for industrial development.

Commercial activity is located in three areas of the town: the central business district, the general business district and the harbor front, each having a blend of professional, institutional, cultural, historical, public and retail services (2).

Clinton has approximately 23 miles of shoreline. The appearance of the coast from the waters is a flat landscape with intermediate shoreline bluffs, and gently rounded hills. The shoreline is densely settled at the eastern end of Cedar Island, Harbor View, Hammock Point, Beach Park, Clinton Beach and Cove Beach. Beach strands are crowded by seasonal cottages. In many places, seawalls and jetties have been constructed to stabilize sand erosion. There are an estimated 725 acres of tidal marshland remaining in Clinton. This marsh system represents an ecological unit which serves both functional and aesthetic purposes (2).

Residential boating is the dominant activity in Clinton Harbor. Eight marinas are located in the harbor with a combined capacity of about 868 slips (4).

Principal industries are fishing and small boat building but the town's commerce depends heavily on water-based recreation activities during the summer months. There are no major industrial users of Clinton Harbor. Some commercial fishing is conducted out of the harbor, with the largest vessel being about 45 feet long.

About 2800 persons reside in the primary impact area (an area of one-mile radius extending from the proposed containment facility). The zoning map, Figure 8-1, shows designated land uses adjacent to the DMCF site. The primary impact area is predominantly wetlands in Hammonasset Beach State Park, followed by village residential, marine business and town-owned space. There is a dumping ground for old sailing vessels on the proposed site, but this is believed to have limited historical or archeological value.

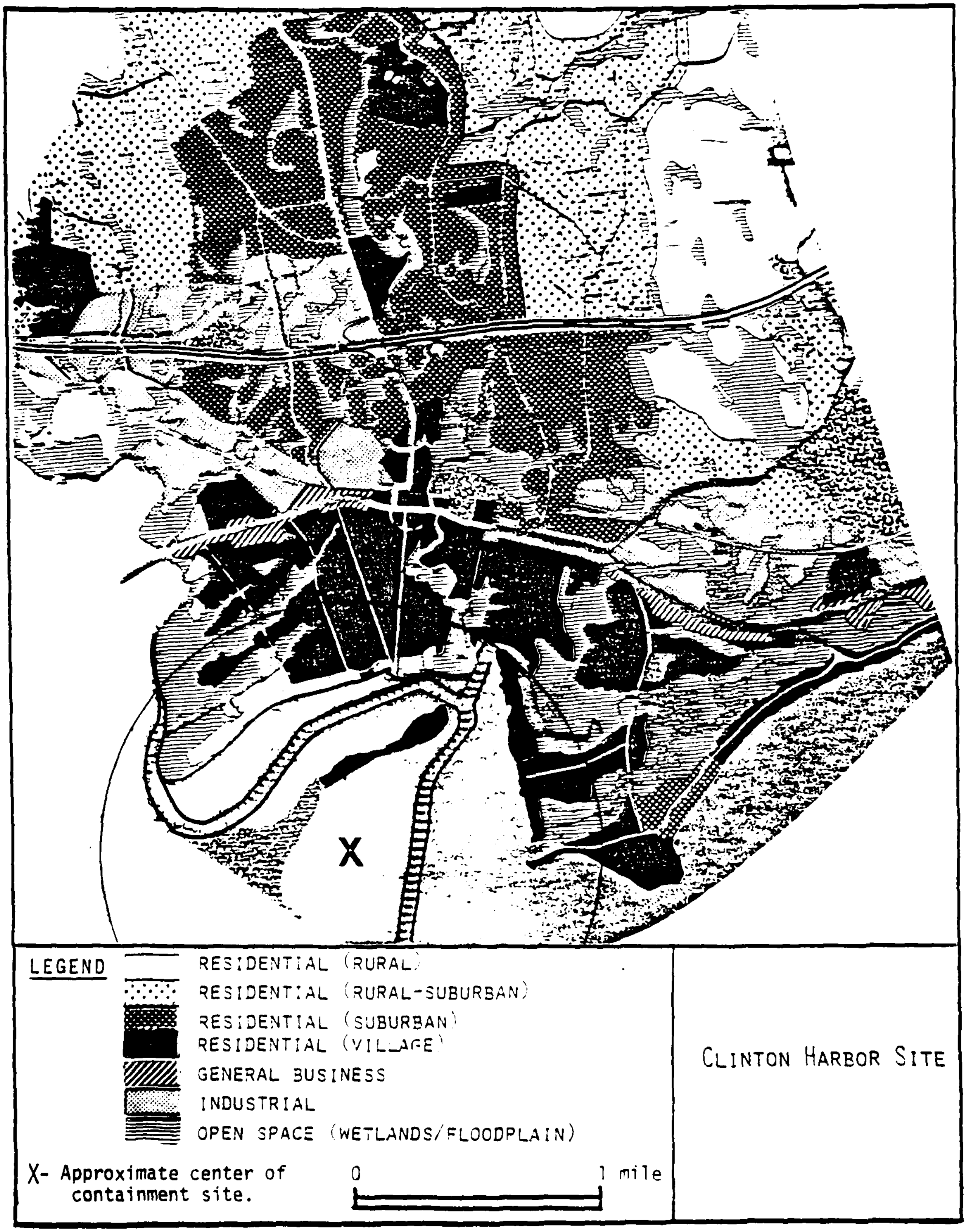

Figure 8-1. Zoning map for Clinton Harbor site.

8.3 Clinton Harbor Scenario

The objective of the Clinton Harbor containment facility is to provide capacity for approximately 310,000 cu yd of material, to be dredged from Clinton Harbor. In its original concept, the Clinton Harbor containment facility was visualized as having a capacity of about 700,000 cu yd. Local opinion leaders indicated a strong desire to size the facility to meet only local needs. This scenario considers only the smaller capacity, which will satisfy the dredged material disposal needs of Clinton Harbor for 25 years. However, a cost analysis has also been conducted for the larger capacity alternative. The proposed location of the prototype facility is shown in Figure 8-2.

Because the objective of the smaller 24-acre containment facility is expansion of the local marsh area, only a low dike will be constructed, using dredged material faced with two feet of riprap for erosion protection. In its final form, the surface of the containment facility would consist of channels for tidal movement with vegetative areas in between, similar to the neighboring marsh. The new marsh would be an average of 240 ft wide, extending 44,900 ft along the present beach. The dike would be breached at several points to allow proper tidal circulation throughout the marsh. Within about two or three years after filling, the dike and dewatered areas within the facility will be covered with a marsh grass similar to that found in the adjacent areas. The gently sloping dike (3:1) would be constructed in about 2 ft of water at Mean Low Water (MLW), and will rise about 9 ft above MLW, appearing similar to the present shoreline after vegetation is established.

The entire Clinton Harbor containment facility dike would be constructed within the course of one year, using a hydraulic dredge and floating pipeline transport and disposal. No work is expected during June, July, August, and September. Work would probably begin about March, with the first dredged material used to construct the low dike. Dredging would take place approximately ten hours/day, five days a week, with only maintenance activities occurring over the weekend. There will be no dredging at night. The floating pipeline will be removed during the summer months. Approximately 75,000 cu yd of material would be dredged and used to form the dike during the Spring and Fall of the first year. Dredged material would be taken only from Clinton Harbor, and would include maintenance and improvement material for the Federal project, as well as private dredged material. Large construction vehicles would be used only rarely--primarily to shape the dike and place riprap and channelize and smooth the surface of the containment facility, after the dredged material has dewatered, prior to the establishment of marsh vegetation.

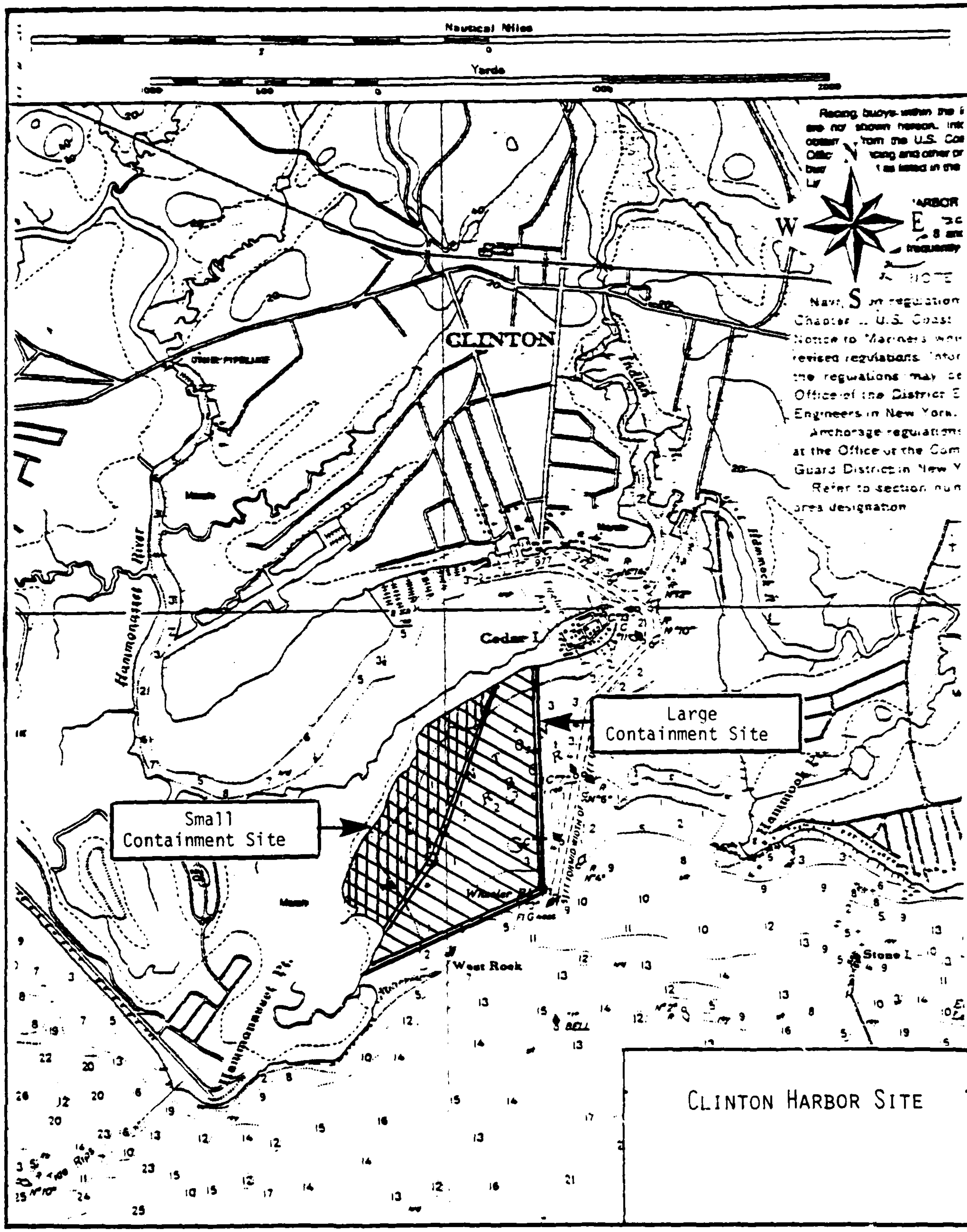

Figure 8-2. Proposed location of prototype dredged material containment facility.

8.4 Social and Economic Impact Analysis

Background

In undertaking Work Order No. 8 for NED/CE, CEM staff performed the analysis of potential impacts in four steps:

1. Review and analysis of 49 dredging/disposal permits issued by NED/CE for Connecticut projects in 1979 and 1980, including:
   - o Agency and general public objections.
   - o Mitigating measures incorporated by the applicant in a revised permit application, in response to formal objections and informal "suggestions" by agencies and the general public.
   - o Special conditions in the permits imposed by NED/CE in response to objections, "suggestions," and/or NED/CE policy.
2. Review of the literature and selection of social, environmental, and economic attributes to be considered, including preparation of preliminary descriptions of each site.
3. On-site personal interviews and telephone contacts with opinion leaders and others to determine on-site public attitudes, and review of NED/CE workshop responses.
4. Preparation of more detailed scenarios for each containment facility, and subjective potential impact evaluation by CEM staff.

The results of the first step are presented in Section 4 of this report. The literature reviewed is cited in Appendix A. Summaries of personal interviews and telephone contacts are given in Appendix B. Appendix E summarizes the written responses to four NED/CE workshops, held in May 1981 at New London, New Haven and Stamford, Connecticut, and Great Neck on Long Island.

Preliminary location maps were prepared for each facility, prior to conducting the public attitude survey. Discussions were held with NED/CE staff, based on preliminary results of the public attitude survey and cost analysis, and the more detailed scenarios were developed (see Section 8.3 above), taking into account many of the comments derived from the public attitude analysis and workshop responses.

Concurrent with the above work, CEM reviewed the literature on social, economic and environmental impact assessment. Using various sources, especially the Water Resources Assessment Methodology (WRAM) developed by the Corps of Engineers, and the Site Evaluation of Energy Conversion Systems (SELECS) methodology developed by CEM for the Department of Energy, five categories of impacts involving 22 attributes were chosen as being most appropriate for this social and impact analysis (5,6,7,8). Table 8-1 provides definitions of the 22 impact attributes.

TABLE 8-1

DEFINITIONS OF 22 IMPACT ATTRIBUTES

Category 1: LIFE, HEALTH, SAFETY

1. Boating Hazards: Those created by barges and support vessels during construction; and those due to containment areas.
2. Construction Hazards: Injuries to workers or to (illegal) visitors during dike building or during placing and grading dredged materials.
3. Final Use Hazards: Creating new land also creates a potential for more accidents as more people visit the site.
4. Traffic Congestion: The number of additional vehicles used during construction and final use is added to the number already present in the primary impact area.
5. Vectors (organisms which can carry and transmit disease): Norway rats and mosquitos are of concern.
6. Air Pollution: Particulate matter--especially dust from movement of dredged material that has been partially dewatered--is the principal pollutant to measure. Exhaust gases from various machines are also considered.

Category 2: COMMUNITY ORGANIZATION

7. Displacement of People: Need for road access during site construction may force relocation. Fishermen, and other commercial, industrial and recreational interests may suffer.
8. Zoning Compatibility: Final use of the site must agree with zoning regulations of the adjacent region. Potential for zoning waivers are considered.
9. Accessibility: Both physical (road access, elevated structures) and psychological (attractiveness of site) are considered.
10. Community Service: Increases in need and use of service personnel such as police, fire and maintenance persons.
11. Perceived Need for a Particular Final Use: What community persons feel and say about what their community needs or lacks the most.

Category 3: FINANCIAL

12. Land Value: Price of property surrounding or near a containment area may be affected; this will be considered.
13. Employment: The number of new jobs created by construction or by final use will be compared to those who are unemployed and are looking for jobs.

Category 4: EDUCATIONAL, CULTURAL, RECREATIONAL

14. Recreational Opportunities: Community population in relation to per capita recreational opportunity will be considered.
15. Educational Opportunities: Community size, number of projected visitors to the site, size of the site and "general educational enthusiasm" will be considered.
16. Proximity of a Cultural Resource: Are there theaters, museums, aquariums, universities or other landmarks close to the site?
17. Historical Significance: Sites in or similar to those in the *National Register of Historic Places* will be identified.

Category 5: AESTHETICS

18. Noise: Machinery used during construction and operation may add, temporarily, to noise level near the site.
19. Odors: Dredged material may contain sediments with organic composition that create odors dispersed by wind. The number of people in the primary impact area is of concern.
20. Exposure: This involves the number of people in in a community who might view and be visually affected by the containment area.
21. Compatibility: How does the proposed site fit in with what is around it? (This goes beyond the question of legal zoning requirements.)
22. Reduction in Panoramic View: Both the dike and the necessary operation equipment may interfere with the opportunities offered by shorelines for wide, unobstructed views.

The remainder of this section contains some of the more significant perceived impacts extracted from the public attitude survey and a subjective preliminary assessment of potential impacts. Because there were differences between the preliminary scenario used in the attitude survey and the more detailed scenario given in Section 8.3, many of the perceived impacts have parenthetical clarifying statements following them. Following next is an eight-page summary of the subjective impact analysis prepared by CEM staff, using the 22 impact attributes.

Perceived Major Social, Economic, and Environmental Impacts

CEM staff visited proposed dredged material containment facility sites and interviewed pertinent persons, such as first selectmen (i.e., mayors), harbor masters, marina operators, and other opinion leaders. In some instances, telephone interviews with other relevant persons were also accomplished (see Appendix B).

Many of those interviewed were acquainted with a list of 22 potential impact attributes compiled by CEM. They were provided with a preliminary estimate of the size and other characteristics of the proposed containment facility, but not the detailed scenario presented above, which was prepared after the first phase of this economic and social impact analysis was completed, and includes mitigating measures suggested by NED/CE. The more significant perceived impacts extracted from the public opinion survey are presented next.

The following summarizes the major impacts extracted from personal and telephone interviews. Clarifying comments responding to some of the perceived major impacts are included parenthetically.

- Work, including dike construction, must not be done in the summer months, May through mid-September. Clinton has the most boating transients of any harbor in Long Island Sound and shellfish will be disturbed. (No work June through September is anticipated.)
- The dike height must be as close to 10 ft above MLW as is technically feasible, or the aesthetic effect will be such that the marsh creation benefits will be felt by the community to be negated. (Dike height will be so limited.)
- The site for the containment facility is full of shellfish, and may mean temporary loss of employment for local fishermen. Most of the site has shellfish presently on it, making avoidance difficult. (Only 24 acres along the shore will be used. Field data taken for NED/CE in Fall 1981 indicate shellfish found only near West Rock, in Madison.)
- Residents of Cedar Island, virtually adjacent to the site, are summer residents and quite sensitive to changes in their environment. (No work in June through September is anticipated.)
- One summer residence, and at least one foundation for a future residence, may lose their waterfront to the outer harbor. (This may occur if largest size containment facility is built, but smaller size for local material only is now planned.)
- The surrounding marsh will contribute to problems with mosquitoes and green-eyed flies (horseflies). (The addition to existing marsh in the harbor region will be less than one percent.)

- o Dispersion of any dust may be significant if it is carried to the northeast to northwest direction. (Vegetation will be established as soon as part of the containtment facility is completed. The surface will be capped with clean sand.)
- o Clinton residents can be expected to resist receiving dredged material from other harbors. (None is expected to be brought in.)
- o There could be an acute, though temporary odor problem, primarily from hydrogen sulfide gas. (Material will be placed only in Spring and Fall. It will be under water until dewatered; then it will be capped with clean material.)
- o Over 100,000 people/year will be able to see the site when completed. (It will appear similar to the extensive neighboring marsh.)
- o Trucks or loud machinery should not be operated at night past local ordinances, unless special mufflers are used. (No night work is anticipated.)
- o Adequate tidal circulation must be planned for a marsh to flourish, and there will probably be many questions about this by informed citizens. (Circulation channels similar to the adjacent existing marsh will be created.)
- o More than 25 percent of the panoramic view may be disrupted. (The 24-acre site will be smaller and lower than initially conceived.)

Results of Subjective Analysis of Potential Impacts

In arriving at subjective judgments concerning the level of potential impacts that might stem from implementation of this prototype dredged material containment facility, consideration was given to short-term impacts associated with the construction, filling, capping and final shaping and seeding of the containment facility, and to long-term impacts that would occur after the facility is completed and is in use. Impacts were assigned both for the primary region within one-mile radius of the facility, and in the secondary impact region of one to five miles radius about the site. Recent low altitude aerial color photography of the site and its surrounding region, as well as maps, personal ground visits and results of personal interviews and telephone contacts, were used as aids in the final process of arriving at judgmental decisions for the level of impacts that may occur.

The impact analysis occurred in three phases. First, a preliminary assessment was made, based on the public attitude response to the preliminary scenario, which described only the physical characteristics of the tentatively conceived prototype containment facility. The preliminary assessment was communicated to NED/CE, along with a more detailed draft scenario that included mitigating measures responsive to many of the significant potential impacts perceived by the public. The scenario presented in the section above was coordinated with NED/CE and then used along with all other pertinent information and data as a basis for the potential impact assessment presented in the following tabular form.

It is emphasized that detailed design, geological and benthic field tests, an environmental impact statement, and a series of public meetings will be accomplished before implementation can begin. It is also important to note that Congress must review and appropriate funds for each project. Thus many of the potential impacts described here may be subject to further mitigating measures before implementation of a prototype dredged material project begins.

SITE: CLINTON HARBOR

PRIMARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Small	Floating pipeline principal hazard. Some recreational and fishing boats may be exposed. No summer dredging.
• Construction Hazards	Negligible	Will be hydraulically pumped, using dredged material and riprap.
• Final Use Hazards	Not applicable Short-term	
• Traffic Congestion	Negligible	Assumes riprap is trucked in through high volume entrance to Hammonasset Beach, during off-season.
• Vectors	Small	Already many insects in surrounding marsh. Must be mitigated carefully to keep impact small.
• Particulates	Negligible	Material will be under water most of time, or vegetated within year after exposure.
2. COMMUNITY ORGANIZATION		
• Displacement	Small	Many oysters reported near West Rock, in Madison. Containment facility can be designed to avoid oyster bed.
• Zoning Compatibility	Not applicable Short-term	
• Accessibility	Moderate	Land access by foot only, but many boats in the area.
• Community Services	None	No police addition expected.
• Perceived Need	Not applicable Short-term	

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	Negligible	Only 24 acres of marsh will be added, to west of all existing housing.
• Employment	Moderately beneficial	Some semi-skilled and unskilled help possibly required including planting marsh grasses.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Small	Little impact expected on Hammonasset State Park or Clinton Harbor, because of no dredging June through September.
• Educational Opportunities	Small	Viewing of construction and marsh planting and successional growth.
• Cultural Resources	Negligible	Historical Society in Town Hall. (See Appendix F.)
• Historical Significance	Small	Old dumping ground for sailing vessels.
5. AESTHETICS		
• Noise	Small	Assume no night work and no dredging June through September.
• Odors	Small	Distant from populace and only clean material involved.
• Exposure	Small	Distant from populace and view obscured by existing marsh grass.
• Compatibility	Small	Construction activities may be obtrusive to residents of Cedar Island.
• Panoramic View	Moderate	Impact primarily associated with boaters and residents of Cedar Island and Hammock Point.

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Negligible	Few boats visit beyond one mile during off-season.
• Construction Hazards	Small	Dike will be hydraulically pumped and protected with riprap. No summer work planned.
• Final Use Hazards	Not applicable Short-term	
• Traffic Congestion	Negligible	Only about 4000 cubic yards of riprap to be transported.
• Vectors	Negligible	No problems expected.
• Particulates	Negligible	Some dust may be created by trucks.
2. COMMUNITY ORGANIZATION		
• Displacement	None	
• Zoning Compatibility	Not applicable Short-term	
• Accessibility	Negligible	Relatively few roads in the community provide access to site--few visitors expected if construction not in summer.
• Community Services	None	None expected to be required.
• Perceived Need	Not applicable Short-term	

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	Sufficient distance.
• Employment	Negligible	Opportunities temporary--unemployment rate low.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Small	Few recreationists during November-April construction period.
• Educational Opportunities	Negligible	A few people may visit construction site.
• Cultural Resources	Negligible	No effect expected, as long as trucks routed on high capacity roadways.
• Historical Significance	Negligible	No effect expected, as long as trucks routed on high capacity roadways.
5. AESTHETICS		
• Noise	Negligible	None expected to exceed 70 db for any considerable length of time.
• Odors	Negligible	Duration limited--though worst conditions might allow permeation beyond one mile.
• Exposure	Negligible	Relatively few vantage points.
• Compatibility	Negligible	Obtrusive character of machinery reduced by distance.
• Panoramic View	Negligible	Distance sufficient that even a 10 ft MLW dike would not be noticeable.

SITE: CLINTON HARBOR PRIMARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Negligible	Not an obstruction.
• Construction Hazards	Not applicable Long-term	
• Final Use Hazards	Negligible	Final use as marsh planned.
• Traffic Congestion	Negligible	No increase expected.
• Vectors	Moderate	Drainage system must function properly, reports of problems with adjacent ditches.
• Particulates	Negligible	Once marsh grasses are planted.
2. COMMUNITY ORGANIZATION		
• Displacement	None	Field data (fall 1981) indicate no shellfish beds need be displaced.
• Zoning Compatibility	Negligible	A marsh should be acceptable, even next to summer homes, since that is present condition.
• Accessibility	Moderately beneficial	Access by foot only-- any haul road must be temporary.
• Community Services	Negligible	No addition on maintenance crew expected.
• Perceived Need	Moderate	Marsh creation would remedy the effects of past marsh filling, and protect existing marsh from erosion.

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	Negligible	Will not affect beach access of any summer residences.
• Employment	Negligible benefit	Few, if any, new jobs will be created.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Moderate benefit	More marsh created to explore.
• Educational Opportunities	Moderate benefit	Potential for school trips to observe marsh development.
• Cultural Resources	Negligible	Historical Society in Town Hall.
• Historical Significance	None	
5. AESTHETICS		
• Noise	Negligible	No noise expected.
• Odors	Negligible	No new source beyond normal marsh smell.
• Exposure	Moderate	Hammonasset Beach--about 100,000 visitors a year to Meigs Points, alone. More to beach area.
• Compatibility	Negligible	Minimal impact from land.
• Panoramic View	Moderate	Ten-foot gently sloped dike will appear similar to present coastline.

SITE: CLINTON HARBOR SECONDARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	None	
• Construction Hazards	Not applicable	
• Final Use Hazards	None	
• Traffic Congestion	None	
• Vectors	Moderate	More wetland (24 acres) available for vector source.
• Particulates	None	
2. COMMUNITY ORGANIZATION		
• Displacement	None	
• Zoning Compatibility	None	
• Accessibility	Moderate	
• Community Services	None	
• Perceived Need	Moderate	There is local enthusiasm to remedy the effects of past marsh filling.

SITE: Clinton Harbor (continued) SECONDARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	
• Employment	Negligible beneficial	
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Negligible beneficial	
• Educational Opportunities	Moderate beneficial	Site will expand opportunity for study of nature and marsh restoration.
• Cultural Resources	Negligible	
• Historical Significance	Negligible	
5. AESTHETICS		
• Noise	None	
• Odors	None	
• Exposure	None	
• Compatibility	None	
• Panoramic View	None	People in secondary impact area are outside view area.

Clinton Harbor

Clinton Harbor is a high value recreation area by virtue of its excellent harbor facilities for recreational boats, the adjacent Hammonasset State Park and overall aesthetic appeal. Creation of additional new marsh using dredged material adjacent to an existing but eroding marsh is viewed at a net benefit to the area. This conclusion is based on expressed desires to protect the existing marsh and to add to wildlife habitat in the area. The value of additional marsh for wildlife viewing and educational purposes is considered significant. The site is relatively distant from residential areas so that potential aesthetic impacts such as odors, noise, etc., would be small. Some concern exists that the marsh will add to existing problems with insects which breed in such areas, and mitigation measures should be investigated and implemented. Short-term interruptions of panoramic view and possible boating hazards, due to equipment placements during construction may occur but the overall impact of these activities is considered small. A shellfish area on the south side of the DMCF may be disturbed.

8.5 Site Cost Analysis

Before discussing the specific cost elements of this containment facility it is useful to consider some of the assumptions and characteristics that are present in the different disposal methods--containment facility, land disposal within one mile of the dredging site, disposal in Long Island Sound 10 miles from the dredging area and disposal in the open ocean about 100 miles from the dredging location.

Containment Facility

If the dredging site is within two miles of the containment facility, it is assumed that hydraulic dredging can occur and the material is transported to the facility through temporary pipeline. Usually, if the dredging site is further than two miles, it is assumed that clamshell dredging occurs and the material is transported by barge. The dredged material is deposited in a small transfer basin at a dike containment facility and then hydraulically pumped to various locations within the facility to fill it. The total cost of disposal of dredged material in the containment facility is computed from the sum of the costs of dredging, transportation, construction of the containment facility and operation of the containment facility during disposal of material.

Land Disposal

A critical assumption in this alternative is that land is available within one mile of each of the dredging sites that are included in the service area of a containment facility. This is certainly a very broad assumption given the reality of environmental constraints and social attitudes prevalent in some communities in the Long Island Sound region. However, land disposal, especially for maintenance dredging of rivers and small harbors with clean material and small volumes continues to be a viable economic option. Given the availability of land, hydraulic dredging is then assumed with pipeline transportation of dredged material.

The total cost of land disposal is strongly influenced by assumptions made concerning the possible cost of obtaining the land for use for disposal of dredged material. It is assumed that the land is available for this use at essentially no charge since, presumably after fill and development, the value of the land for sale or other use should be at least what it was initially. The unit cost (dredging transportation and disposal) is always least for land disposal compared with the other alternatives considered. However, if it were assumed that land must be acquired for the purpose of disposal of dredged material and that the purchase price is $30,000 per acre, the land disposal unit cost might be greater than the cost for disposal in a containment facility.

Long Island Sound Disposal

The critical assumption of the alternative method of disposal in Long Island Sound is that a site is available approximately 10 miles from the area of dredging activity. The disposal site is assumed to be an average distance of 10 miles from all dredging sites associated with a particular containment facility. In all cases it is assumed that clamshell dredging occurs and the dredged material is transported to the disposal site by barge. Based on the Statement of Work, for comparative purposes, a unit cost is computed for the dredging and transportation and is therefore, a fixed value of $4.20/cu yd that will not vary with the dredging associated with different containment facilities.

Open Ocean Disposal

The assumptions for open ocean disposal are similar to those for disposal in Long Island Sound with the exception that the disposal site is assumed to be an average distance of 100 miles offshore from the dredging activity. With the assumptions of clamshell dredging and barge transport, a fixed unit cost of $6.60/cu yd is obtained for comparison with costs of other disposal options.

The basic cost factors that are common to all sites and are used in the costing computations are given in Table 8-2. These cost factors are discussed in Section 11.0.

In addition to these basic cost factors there are a number of site specific characteristics that significantly affect the total and unit costs associated with a given prototype containment facility.

TABLE 8-2

COST FACTORS USED IN COMPUTATIONS

Operation	Cost
Hydraulic Dredging	\$ 1.00/cu yd
Clamshell Dredging	\$ 1.50/cu yd
Barge Transportation to 10 Miles	\$ 2.70/cu yd
Barge Transportation to 100 Miles	\$ 5.10/cu yd
Temporary Pipeline Transportation	\$ 0.325 mil /mile*
Open Water Dike Construction	Cost/mile = $(1.5\,H^2 + 10H)\ \$2374 + K_1HT_1 + K_2HT_2$
Sheltered Water Dike Construction (Beach)	Cost/mile = $(1.0H^2 + 10H)\ \$2347 + K_2HT_1 + K_2HT_2$, where T_2 = sheltered riprap thickness (ft), K_2 = \$6914 and $K_1 = \begin{cases} \$\ 10{,}932, & T_1 = 1\text{-}2 \text{ ft} \\ \$\ 52{,}565 & T_1 = 4 \text{ ft.} \end{cases}$
Containment Facility Operation	\$ 50,000/year
Acquisition of Land for Land Disposal	Nothing or \$ 30,000/acre
Construction and Operation of Land Disposal	\$ 0.50/cu yd

*This represents a 30% increase over the usual cost of $0.25 mil/mile to reflect the requirements of a booster pump for the ?-mile transportation distance.

Table 8-3 presents the pertinent overall physical characteristics of the containment facility (dike length and height and containment facility area and capacity) as well as the time period estimated for filling the facility and the source of dredged materials. Additional special characteristics are noted. In the case of the prototype containment facility at Clinton Harbor with a limited capacity of 310,000 cu yd, the capacity includes the fill material used for the marsh containment dike. Thus, the construction cost of the dike is limited to the cost of placing riprap. The construction of the larger capacity containment facility (700,000 cu yd) includes the usual costing for both dike material and riprap. Both prototype containment facilities are filled only with material from Clinton Harbor. It is assumed that all material from improvement dredging would be deposited in the facilities. The smaller prototype containment facility is to be filled in 25 years.

TABLE 8-3

CLINTON HARBOR CONTAINMENT FACILITY CHARACTERISTICS

Item	Units	Hydraulic Dredging Scenarios	
Containment Facility Dike Length	ft	4400	5600
Containment Facility Dike Height	ft	11	20
Containment Facility Exposed Surface Slope	--	1:3	1:2
Containment Facility Riprap Thickness or Exposed Surface	ft	2	2
Containment Facility Area	acres	23	100
Containment Facility Capacity	cu yd	310,000	700,000
Period of Disposal	yr	25	56*
Source and Amount of Dredged Material	cu yd		
Clinton Harbor (1 mile)		310,000	700,000
Total Dredged Material	cu yd	310,000	700,000
Special Remarks: The 310,000 cu yd containment facility volume includes the fill material that is used for construction of the small dike.			

*If only 10% of Improvement Dredged Material is deposited in Containment Facility, the period of disposal is about 85 years.

A comparison of the total cost and unit costs obtained for each disposal alternative is given in Table 8-4. Cost analysis indicates the most economical method of disposing of dredged material from Clinton Harbor to be land disposal. This conclusion, however, is dependent on the availability of land at no cost within one mile of dredging, which may not be possible. Approximately 43 acres would be needed to dispose of 700,000 cu yd of dredged material assuming an average fill depth of 10 feet. Only 24 acres are needed for 310,000 cu yd of dredged material. (There is little likelihood that nearshore land for upland disposal can be found in Clinton.)

TABLE 8-4

COMPARISON OF COSTS OF ALTERNATIVE METHODS OF DISPOSAL
WITH DISPOSAL AT CLINTON HARBOR CONTAINMENT FACILITY

Disposal Method	Dredging Method	Transport Method	Costs ($ Millions)					Unit Cost
			Dredging	Transport	Construct.	Disposal	Total	($/cu yd)
Containment Facility	1. Hydraulic	Pipe (1 mi)	0.310	0.250	0.283	0.300*	1.143	3.69
	2. Clamshell	Barge (mi)						
	3. Hydraulic (100%)	Pipe (1 mi)	0.700	0.250	2.603	0.700*	4.253	6.08
	Clamshell (0 %)	Barge (mi)						
Land	4. Hydraulic	Pipe (1 mi)	0.310	0.250	-	0.155	0.715	2.31
Long Island Sound	5. Clamshell	Barge (10 mi)	0.465	0.837	-	-	1.302	4.20
Ocean	6. Clamshell	Barge (100 mi)	0.465	1.581	-	-	2.046	6.60

*Includes active disposal operations approximately every 4 years.

If a $30,000/acre cost of land acquisition is assumed, the unit cost of land disposal of 310,000 cu yd of dredged material would be $4.15/cu yd rather than the $2.31/cu yd computed under the assumption of no-cost land availability. With this assumption, land disposal cost would be similar to disposal in Long Island Sound.

The unit cost of disposal at the smaller prototype Clinton Harbor Containment Facility is only $3.69/cu yd. This is considerably less than the unit cost for disposal in Long Island Sound and less than half the cost of open ocean disposal. It must be kept in mind, however, that with the availability of dredged material close to the

containment facility, allowing hydraulic dredging and short distance pipeline transportation of material, a controlling element of the cost analysis is the construction of the containment facility at Clinton Harbor. Cost of construction of the smaller containment facility is quite low because it will be a hydraulically pumped containment dike. This is not true of the large containment facility of 700,000 cu yd capacity. In this case, under the assumption of conventional dike construction the unit cost is $6.08/cu yd. The cost of construction of the larger dike accounts for 61 percent of the total cost. Even in this instance, however, the unit cost is lower than open ocean disposal.

8.6 Summary

Cost estimates have been performed for two sizes of containment facilities in Clinton Harbor but an impact assessment has been carried out only for the smaller facility because a public attitude survey indicated strong resistance to a facility larger than that needed for Clinton Harbor. Further discussion pertains to the smaller facility only.

The 0.31 million cu yd containment facility at Clinton Harbor will be created by a 4400 ft long dike along the western shore of Clinton Harbor having an elevation of only 9 ft above Mean Low Water. The dike will be faced with two feet of riprap on a gentle slope. The planned final use of the site is for creation of a marsh similar to present marshes found extensively in the area. Particular attention will be paid to proper marsh drainage to minimize insect problems. This project would add only a few percent to the existing marsh areas and would in fact partially compensate for lost marshland that has been filled in the past. The most significant adverse impact may be on existing shellfishing. A biological survey now underway will establish the potential level of impacts.

There will be no dike construction, dredging or material placement during the months of June, July, August and September; and no night work is anticipated at any time. The dike would be constructed during Spring and Fall of the first year; filling could begin in the Spring of the second year and would continue intermittently for about 25 years. The dike will require 75,000 cu yd of material dredged hydraulically and transported by temporary floating pipeline.

The unit cost of disposal at the Clinton Harbor prototype dredged material containment facility is \$3.69/cu yd, which is less than either disposal in Long Island Sound (\$4.20/cu yd) or open ocean disposal (\$6.60/cu yd). However, land disposal is the most economical disposal method at \$2.31/cu yd, **if** it is assumed that land for fill is available at no cost within one mile of all dredging, no dikes or water treatment are required, and hydraulic dredging is carried out with transport of the dredged material by temporary pipeline to the disposal site. The unit cost for containment facility disposal is dependent on the assumption of all fill material coming from local hydraulic dredging with temporary pipeline transport for distances up to one mile to include all of Clinton Harbor. The unit cost is also affected by the assumption that the dike is constructed of hydraulically-pumped material and the only construction cost is essentially the surface placement of two feet of riprap.

8.7 References

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4. The Center for the Environment and Man, Inc. Long Island Sound Harbor Market User's Survey, CEM Report, Hartford, CT, 1981.

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9.0 SITE ANALYSIS #5: TWOTREE ISLAND/WATERFORD

9.1 Introduction

This section presents the detailed results of the analysis of social and economic impacts associated with the construction and final use of a prototype dredged material containment facility at Twotree Island off the Waterford shoreline. Short-term impacts during construction of dikes, filling with dredged material, dewatering, and final capping, contouring and planting have been examined, as well as long-term impacts involving final use.

The background material essential for assessing impacts is summarized in Section 9.2. A scenario for the construction, filling and completion of the containment facility is given in Section 9.3. The short-term and long-term socioeconomic impacts are presented and evaluated in Section 9.4. The cost analysis is given in Section 9.5 and a summary of the most pertinent results is given in Section 9.6

9.2 Background

Waterford is situated on the eastern shoreline of Long Island Sound in Connecticut. The shoreline community of East Lyme lies to the west of Waterford and New London is located to the east. The town of Waterford is 34.4 square miles in area with a population of about 17,843 in 1980. This is an increase of about 3.6 percent from the population in 1970. The approximate population density is 520 persons per square mile. The number of households (dwelling units) totaled 6405 in 1980. This is a 15.7 percent increase from 1970. Access to Waterford is by way of Route 1, Route 156 and Route 213, and Penn Central Train Service. In 1977, 14,032 taxable motor vehicles were registered in Waterford.

Waterford has one of the lowest tax mill rates in the state—19 mills with a net taxable grand list of $688,922,730, reported for 1978-1979. The mean per capita income in Waterford in 1975 was $5324 slightly below the state average of $5,571 (1).* The largest taxpayer in Waterford is Northeast Utilities which owns and operates two nuclear power stations at Millstone Point with a third under construction (2). Total non-agricultural and manufacturing employment in June 1977 was 4010 (1). Approximately ten manufacturing companies are located in Waterford (3).

In 1970, the land use percentages were: residential, 14 percent; commercial/industrial, 5.4 percent; other, 56.9 percent; and unused, 23.7 percent.

*Numbers refer to references at the end of this section.

Very little recreational boating occurs in the waters between Twotree Island and the shore and no marine facilities are located along the shore. No dredged channel exists, although a natural channel, Twotree Island Channel, passes to the north between the island and the shore. The channel has a minimum depth of 28 ft. The power stations at Millstone Point use the channel for servicing, maintenance and construction purposes at these facilities. Water-related activities mainly occur at Pleasure Beach, northeast of Twotree Island and east of Millstone Point across open water. About 35,000 persons utilized this quasi-public facility in 1978 (4). Harkness Memorial State Park is located about two miles northeast of Twotree Island and is of historical significance (5).

The zoning map, Figure 9-1, shows designated areas of residential and industrial lands within one mile of the proposed DMCF. The area most affected by a containment facility would probably be Millstone Point. The containment facility might interfere with currents in the area which facilitates the mixing of released heated water with the cooler water of the Sound. The project could also interfere with biological and physical sampling in the Sound, which is part of the monitoring of the effects the power stations have on the ecology of the area. Release of sediments either accidentally or in the event of structural failure could pose problems for water intake structures located in the area (6).

The State Sanitorium at Millstone is located within the primary impact area. No other areas of cultural, archeological, or historic significance are located in the primary impact area. The possibility of using the containment facility as a wetland exists, although significant wetland areas already exist (7). The best final usage probably is a bird sancturary. Pleasure Beach also lies in the primary impact area and the facility may have some limited visual impact on the popular, predominantly private, recreation area.

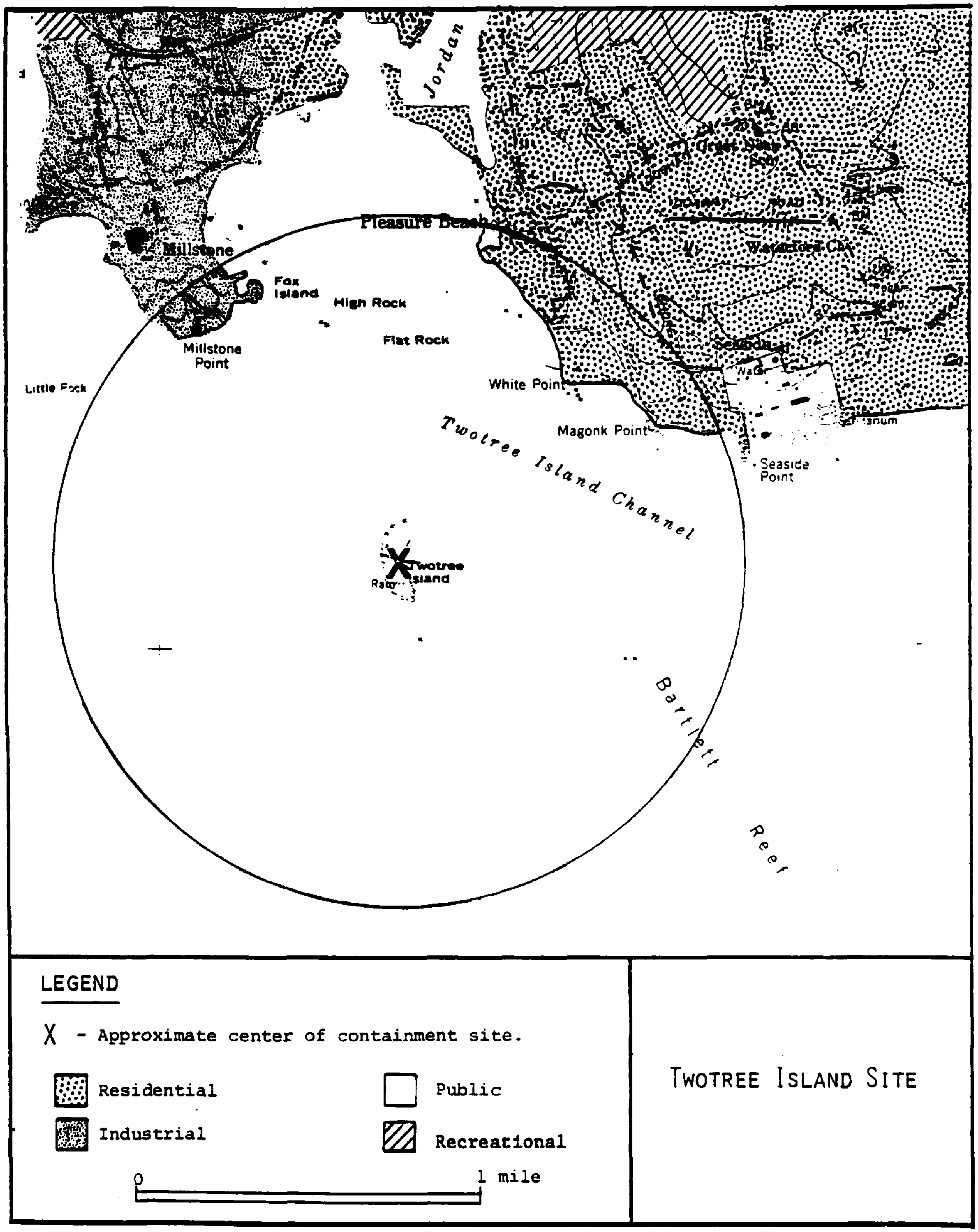

Figure 9-1. Zoning map for Twotree Island site.

9.3 Twotree Island/Waterford Scenario

The objective of the Twotree Island/Waterford containment facility is to provide capacity for approximately 3.4 million cu yd of material to be dredged from New London Harbor and other eastern Long Island Sound ports.

The final use of the 80-acre containment facility would be as an island refuge for birds and passive recreation activities, such as bird watching etc. At present, Twotree Island is essentially a rock outcropping with no vegetation cover, about 150 to 200 ft long by 30 to 50 ft at its widest. It is part of a ridge which extends underwater close to the surface to the north at least 500 ft and to the south about 200 ft. It lies almost three-quarters of a mile southwest of White Point, and about nine-tenths of a mile southeast of Millstone Point, off the coastline of the the Town of Waterford. The location of the proposed containment facility is shown in Figure 9-2. The containment facility would enclose Twotree Island with a 40-ft dike almost 7700 ft in length, rising to a height of 20 ft above Mean Low Water. The dike would have a free-form shape, simulating the "natural" contours of the shoreline of an island. There would be a 1500-ft interior dike, separating the containment facility into two cells each about 40 acres in area. The dike would be constructed of about 810,000 cu yd of suitable material removed from inland borrow pits, trucked to a coastal location (probably nearby New London Harbor), and barged to the Twotree Island area.

Dike construction of the containment facility would take place during a March-through-November nine-month period of nearly 200 working days, based on a five-day week. Nearly 4000 cu yd of dike material will be moved from inland borrow pits to a barge-loading facility each 10-hour working day, requiring 16 to 20 loads delivered per hour, depending on truck capacity. Such transportation rates are commensurate with typical earth movement for interstate highway construction. Haulage will not take place at night. An alternative might be to use rail cars to haul the dike material to New London Harbor. Barges with a capacity of about 1000 cu yd or more would be used, implying five or fewer barge trips from the shore to the Twotree Island site each working day, or one round trip every two hours or more, depending on barge size. This frequency of barge trips is not expected to interfere significantly with summer recreational boating or commercial or military ship traffic

Placing 3.4 million cu yd of dredged material in the Twotree Island containment facility is expected to take up to 30 years. All material would be dredged by clamshell from nearby sites and barged to the containment facility. There it would be dumped in

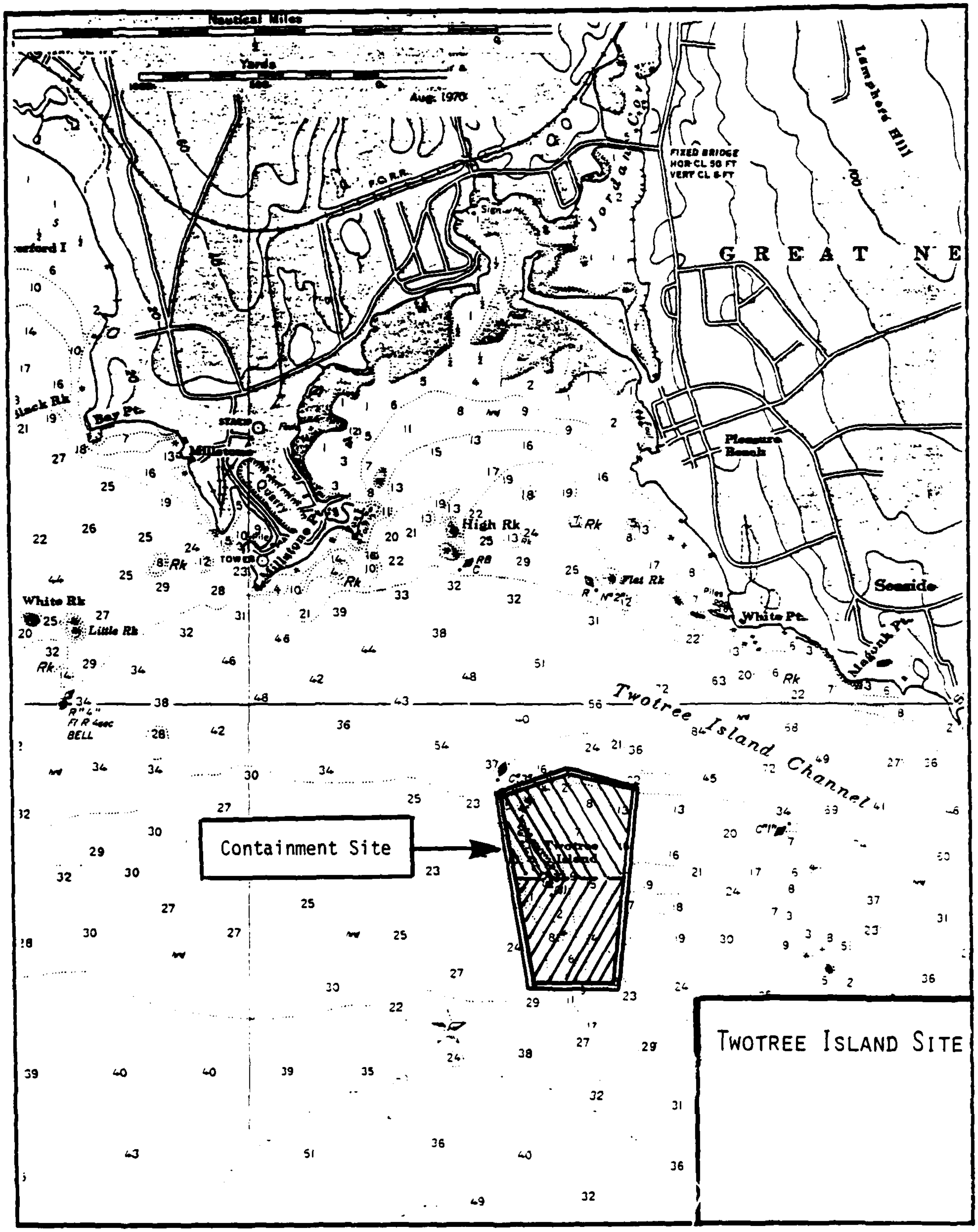

Figure 9-2. Proposed location of prototype dredged material containment facility.

the water of a transfer basin where a hydraulic dredge will remove the material from the basin and convey it by floating pipeline inside the facility to various containment parts of the containment cells.

When a cell has been filled and dewatered, it will be capped with 2 ft of clean material. The surface will be gently shaped and contoured to provide variations in final elevation of up to 10 ft, to provide diversity of habitat for birds and other animals that will ultimately make the island their home. Drainage to minimize insect breeding areas will be provided. Grass and low trees will be planted to provide habitat cover. In its final form, at a distance of one-half mile or more, the newly erected island will appear aesthetically similar to other numerous rocky islands along the Connecticut shoreline, such as Pine Island and Bushy Point (island), off Avery Point.

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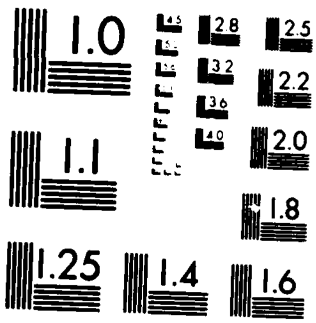

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

9.4 Social and Economic Impact Analysis

Background

In undertaking Work Order No. 8 for NED/CE, CEM staff performed the analysis of potential impacts in four steps:

1. Review and analysis of 49 dredging/disposal permits issued by NED/CE for Connecticut projects in 1979 and 1980, including:
   - o Agency and general public objections.
   - o Mitigating measures incorporated by the applicant in a revised permit application, in response to formal objections and informal "suggestions" by agencies and the general public.
   - o Special conditions in the permits imposed by NED/CE in response to objections, "suggestions," and/or NED/CE policy.
2. Review of the literature and selection of social, environmental and economic attributes to be considered, including preparation of preliminary descriptions of each site.
3. On-site personal interviews and telephone contacts with opinion leaders and others to determine on-site public attitudes, and review of NED/CE workshop responses.
4. Preparation of more detailed scenarios for each containment facility, and subjective potential impact evaluation by CEM staff.

The results of the first step are presented in Section 4 of this report. The literature reviewed is cited in Appendix A. Summaries of personal interviews and telephone contacts are given in Appendix B. Appendix E summarizes the written responses to four NED/CE workshops held in May 1981 at New London, New Haven and Stamford, Connecticut, and Great Neck on Long Island.

Preliminary location maps were prepared for each facility, prior to conducting the public attitude survey. Discussions were held with NED/CE staff, based on preliminary results of the public attitude survey and cost analysis, and the more detailed scenarios were developed (see Section 9.3 above), taking into account many of the comments derived from the public attitude analysis and workshop responses

Concurrent with the above work, CEM reviewed the literature on social, economic and environmental impact assessment. Using various sources, especially the Water Resources Assessment Methodology (WRAM) developed by the Corps of Engineers, and the Site Evaluation of Energy Conversion Systems (SELECS) methodology developed by CEM for the Department of Energy, five categories of impacts involving 22 attributes were chosen as being most appropriate for this social and impact analysis (8,9,10,11). Table 9-1 provides definitions of the 22 impact attributes.

TABLE 9-1

DEFINITIONS OF 22 IMPACT ATTRIBUTES

Category 1: LIFE, HEALTH, SAFETY

1. Boating Hazards: Those created by barges and support vessels during construction; and those due to containment areas.
2. Construction Hazards: Injuries to workers or to (illegal) visitors during dike building or during placing and grading dredged materials.
3. Final Use Hazards: Creating new land also creates a potential for more accidents as more people visit the site.
4. Traffic Congestion: The number of additional vehicles used during construction and final use is added to the number already present in the primary impact area.
5. Vectors (organisms which can carry and transmit disease): Norway rats and mosquitos are of concern.
6. Air Pollution: Particulate matter--especially dust from movement of dredged material that has been partially dewatered--is the principal pollutant to measure. Exhaust gases from various machines are also considered.

Category 2: COMMUNITY ORGANIZATION

7. Displacement of People: Need for road access during site construction may force relocation. Fishermen, and other commercial, industrial and recreational interests may suffer.
8. Zoning Compatibility: Final use of the site must agree with zoning regulations of the adjacent region. Potential for zoning waivers are considered.
9. Accessibility: Both physical (road access, elevated structures) and psychological (attractiveness of site) are considered.
10. Community Service: Increases in need and use of service personnel such as police, fire and maintenance persons.
11. Perceived Need for a Particular Final Use: What community persons feel and say about what their community needs or lacks the most.

Category 3: FINANCIAL

12. Land Value: Price of property surrounding or near a containment area may be affected; this will be considered.
13. Employment: The number of new jobs created by construction or by final use will be compared to those who are unemployed and are looking for jobs.

Category 4: EDUCATIONAL, CULTURAL, RECREATIONAL

14. Recreational Opportunities: Community population in relation to per capita recreational opportunity will be considered.
15. Educational Opportunities: Community size, number of projected visitors to the site, size of the site and "general educational enthusiasm" will be considered.
16. Proximity of a Cultural Resource: Are there theaters, museums, aquariums, universities or other landmarks close to the site?
17. Historical Significance: Sites in or similar to those in the *National Register of Historic Places* will be identified.

Category 5: AESTHETICS

18. Noise: Machinery used during construction and operation may add, temporarily, to noise level near the site.
19. Odors: Dredged material may contain sediments with organic composition that create odors dispersed by wind. The number of people in the primary impact area is of concern.
20. Exposure: This involves the number of people in in a community who might view and be visually affected by the containment area.
21. Compatibility: How does the proposed site fit in with what is around it? (This goes beyond the question of leç , zoning requirements.)
22. Reduction in Panoramic View: Both the dike and the necessary operation equipment may interfere with the opportunities offered by shorelines for wide, unobstructed views.

The remainder of this section contains some of the more significant perceived impacts extracted from the public attitude survey and a subjective preliminary assessment of potential impacts. Because there were differences between the preliminary scenario used in the attitude survey and the more detailed scenario given in Section 9.3, many of the perceived impacts have parenthetical clarifying statements following them. Following next is an eight-page summary of the subjective impact analysis prepared by CEM staff, using the 22 impact attributes.

Perceived Major Social, Economic, and Environmental Impacts

CEM staff visited proposed dredged material containment facility sites and interviewed pertinent persons, such as first selectmen (i.e., mayors), harbor masters, marina operators and other opinion leaders. In some instances, telephone interviews with other relevant persons were also accomplished (see Appendix B).

Many of those interviewed were acquainted with a list of 22 potential impact attributes compiled by CEM. They were provided with a preliminary estimate of the size and other characteristics of the proposed containment facility, but not the detailed scenario presented above, which was prepared after the first phase of this economic and social impact analysis was completed, and includes mitigating measures suggested by NED/CE. The more significant perceived impacts extracted from the public opinion survey are presented next.

The following summarizes the major impacts extracted from personal and telephone interviews. Clarifying comments responding to some of the perceived major impacts are included parenthetically.

- o The Millstone Nuclear Power Plant particularly the Millstone II cooling water intake, may experience increased siltation from current changes due to the site. (A circulation study is expected to be performed.)
- o Although there are no marinas in the immediate area, many recreational vessels utilize the region, and avoiding summer construction is advisable. (No dredging June through September is anticipated.)
- o The distance of the site to land puts it beyond police and zoning jurisdictions, and use of the island may be abused, because it will not be supervised. (Problems are expected to be no different from those at nearby Pine Island and Bushy Point island)
- o There is concern about the effect of the site upon 100-year flood levels.
- o A recent proposal to expand the town landfill was defeated, and any consideration of the site as a "dump" will bring many people "out of the woodwork" in opposition. (Site end use is expected to be bird habitat and passive recreation, i.e., birdwatching.)
- o The composition of deposited material, especially with regard to heavy metals, must be presented.
- o The site presently has many scallops.

- o Land quarters for workers may be difficult to find, especially near the shore. (The work force will be quite small, and work will occur outside the recreational season, when accommodations are plentiful.
- o About 3700 people can see the sight daily, although due to the distance from shore, it will not significantly affect the panoramic view.

Results of Subjective Analysis of Potential Impacts

In arriving at subjective judgments concerning the level of potential impacts that might stem from implementation of this prototype dredged material containment facility, consideration was given to short-term impacts associated with the construction, filling, capping and final shaping and seeding of the containment facility, and to long-term impacts that would occur after the facility is completed and is in use. Impacts were assigned both for the primary region within one-mile radius of the facility, and in the secondary impact region of one to five miles radius about the site. Recent low altitude aerial color photography of the site and its surrounding region, as well as maps, personal ground visits and results of personal interviews and telephone contacts, were used as aids in the final process of arriving at judgmental decisions for the level of impacts that may occur.

The impact analysis occurred in three phases. First, a preliminary assessment was made, based on the public attitude response to the preliminary scenario, which described only the physical characteristics of the tentatively conceived prototype containment facility. The preliminary assessment was communicated to NED/CE, along with a more detailed draft scenario that included mitigating measures responsive to many of the significant potential impacts perceived by the public. The scenario presented in the section above was coordinated with NED/CE and then used along with all other pertinent information and data as a basis for the potential impact assessment presented in the following tabular form.

It is emphasized that detailed design, geological and benthic field tests, an environmental impact statement, and a series of public meetings will be accomplished before implementation can begin. It is also important to note that Congress must review and appropriate funds for each project. Thus many of the potential impacts described here may be subject to further mitigating measures before implementation of a prototype dredged material project begins.

SITE: TWOTREE ISLAND/WATERFORD PRIMARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Moderate	Recreational use near site heavy in summer.
• Construction Hazards	Moderate	Large volume of dike fill to be transported to and deposited at site. However, site accessible to boaters only.
• Final Use Hazards	Not applicable Short-term	
• Traffic Congestion	Moderate	Only if dike material is trucked to barge dock. Negligible if rail used.
• Vectors	Negligible	The distance from shore will minimize insect travel.
• Particulates	Negligible	Island sufficiently far off shore.
2. COMMUNITY ORGANIZATION		
• Displacement	Moderate	Scallops on site, but relatively few fishermen in area.
• Zoning Compatibility	Not applicable Short-term	
• Accessibility	Negligible	Accessible by boat only. Little or no dredged material disposal during summer assumed.
• Community Services	Moderate	Not clear if site outside of local police jurisdiction. Contractor should arrange for hospital services for anyone injured at site.
• Perceived Need	Not applicable Short-term	

SITE: Twotree Island (continued) PRIMARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	Far enough out to make no difference.
• Employment	Negligible benefit	Some temporary opportunities possible.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Moderate	Construction/filling activities may interfere with recreational boating.
• Educational Opportunities	Negligible	Can only visit by boat.
• Cultural Resources	None	None nearby. (See Appendix F.)
• Historical Significance	None	
5. AESTHETICS		
• Noise	Moderate	Assume truck hauling only in daylight hours.
• Odors	Negligible	Site about 3/4 mile away from land; will be filled in increments; material under water most of time.
• Exposure	Moderate	Predominantly seen from Millstone, Pleasure Beach, and Seaview Regional Center.
• Compatibility	Small	Construction activity may appear obtrusive to some.
• Panoramic View	Moderate	Dike is 20 ft above mean low water; similar to nearby natural islands.

SITE: TWOTREE ISLAND/WATERFORD

SECONDARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Moderate	Dike material will be brought by barge from nearby port, such as New London.
• Construction Hazards	Moderate	Location of source for dike material not yet determined.
• Final Use Hazards	Not applicable Short-term	
• Traffic Congestion	Moderate	If trucks are used;otherwise none.
• Vectors	Negligible	No problem resulting from site expected for whole community.
• Particulates	Negligible	Some dust from movement of dike material, if trucks used.
2. COMMUNITY ORGANIZATION		
• Displacement	None	
• Zoning Compatibility	Not applicable Short-term	
• Accessibility	Negligible	Access only by water--few expected.
• Community Services	None	No expected change required.
• Perceived Need	Not applicable Short-term	

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	Distance sufficient.
• Employment	Negligible	Duration temporary.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Negligible	Construction and disposal activities scheduled for non-recreation season.
• Educational Opportunities	Negligible	A few curious boaters may visit the site.
• Cultural Resources	Negligible	No effect expected, as long as trucks routed away. (See Appendix F.)
• Historical Significance	Negligible	No effect expected, as long as trucks routed away.
5. AESTHETICS		
• Noise	Negligible	None expected to exceed 70 db for any considerable duration.
• Odors	None	Clean material will be used for dike construction.
• Exposure	Negligible	Relatively few vantage points.
• Compatibility	Negligible	Obtrusive character of machinery reduced by distance.
• Panoramic View	Moderate	Site will be observable beyond one mile.

SITE: TWOTREE ISLAND/WATERFORD PRIMARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Moderate benefit	Aid to location of submerged rocks in area.
• Construction Hazards	Not applicable Long-term	
• Final Use Hazards	Moderate	High dike would make visits by people somewhat hazardous.
• Traffic Congestion	None	Island site, not open as a park.
• Vectors	Negligible	Site is about 3/4 mi from the nearest land.
• Particulates	None	No dust expected after grass planted.
2. COMMUNITY ORGANIZATION		
• Displacement	Moderate	Scallop bed will be displaced.
• Zoning Compatibility	Negligible	Not zoned, but no problem anticipated.
• Accessibility	Negligible	Accessible by vessel only.
• Community Services	Moderate	Not clear if site within local police jurisdiction. Need procedures for handling emergencies.
• Perceived Need	Moderate benefit	Local conservation group recommends site for expanding wildlife habitat.

SITE: Twotree Island (continued) PRIMARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	Site is too far away.
• Employment	Small benefit	Possible supervision of wildlife sanctuary.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Negligible benefit	While bird-watching opportunities will exist, no public facilities currently planned.
• Educational Opportunities	Moderate benefit	Good opportunities are available; use by public should be considered.
• Cultural Resources	None	
• Historical Significance	None	
5. AESTHETICS		
• Noise	None	
• Odors	None	None from site once material has dried and been capped.
• Exposure	Moderate	Primarily Millstone, Pleasure Beach, and Valley Regional Center.
• Compatibility	Moderate	New island will somewhat alter the area character.
• Panoramic View	Moderate	Dikes are sufficiently distant. Will appear similar to other nearby islands.

SITE: TWOTREE ISLAND/WATERFORD SECONDARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	None	
• Construction Hazards	Not applicable	
• Final Use Hazards	None	
• Traffic Congestion	None	
• Vectors	None	
• Particulates	None	
2. COMMUNITY ORGANIZATION		
• Displacement	None	
• Zoning Compatibility	None	
• Accessibility	Negligible	
• Community Services	None	
• Perceived Need	Moderate benefit	Site will expand available wildlife habitat.

SITE: Twotree Island (continued) SECONDARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	
• Employment	Negligible beneficial	
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Moderate beneficial	Projected habitat of value to area wildlife enthusiasts for field trips.
• Educational Opportunities	Moderate beneficial	Projected habitat of value to area science educators for field trips.
• Cultural Resources	Negligible	
• Historical Significance	Negligible	
5. AESTHETICS		
• Noise	None	
• Odors	Not applicable	
• Exposure	Negligible	
• Compatibility	Negligible	
• Panoramic View	Negligible	People in secondary impact area are outside view area.

Twotree Island Site

Adverse impacts associated with the Twotree Island site arise primarily during construction phases and relate to the large volume of dike material required for creating the containment facility and placement of dike material in an open water situation. Road haulage of dike material could result in traffic congestion on area highways although rail haulage to barge loading sites would avoid many of these problems. Heavy recreational boating use near the site may result in boating hazards relating to construction and filling operations although operations are not scheduled during the summer recreation season. Creation of new land offshore of Waterford may be opposed by some because of visual exposure and reduction of panoramic view although the site will look similar to other offshore islands in the area. Displacement of scallop beds is an unavoidable but localized consequence of island creation.

Concerns are articulated by local authorities regarding jurisdiction of created land at Twotree Island. Apparently, the site is beyond local police jurisdiction and problems with unsupervised usage of the site by the boating public may arise.

Benefits ascribed to creation of a DMCF island at Twotree Island relate to creation of new habitat for birds and other wildlife. Proposed usage of the site as wildlife habitat and passive recreation is advocated by a local conservation group. Short-term problems with boating hazards may be offset over the long-term by clearly demarking an area of shallow water currently considered a boating hazard.

9.5 Site Cost Analysis

Before discussing the specific cost elements of this containment facility it is useful to consider some of the assumptions and characteristics that are present in the different disposal methods--containment facility, land disposal within one mile of the dredging site, disposal in Long Island Sound 10 miles from the dredging area and disposal in the open ocean about 100 miles from the dredging location

Containment Facility

If the dredging site is within two miles of the containment facility it is assumed that hydraulic dredging can occur and the material is transported to the facility through temporary pipeline. Usually, if the dredging site is further than two miles, it is assumed that clamshell dredging occurs and the material is transported by barge The dredged material is deposited in a small transfer basin at a dike containment facility and then hydraulically pumped to various locations within the facility to fill it. The total cost of disposal of dredged material in the containment facility is computed from the sum of the costs of dredging, transportation construction of the containment facility and operation of the containment facility during disposal of material.

Land Disposal

A critical assumption in this alternative is that land is available within one mile of each of the dredging sites that are included in the service area of a containment facility. This is certainly a very broad assumption given the reality of environmental constraints and social attitudes prevalent in some communities in the Long Island Sound region. However, land disposal, especially for maintenance dredging of rivers and small harbors with clean material and small volumes continues to be a viable economic option. Given the availability of land, hydraulic dredging is then assumed with pipeline transportation of dredged material.

The total cost of land disposal is strongly influenced by assumptions made concerning the possible cost of obtaining the land for use for disposal of dredged material. It is assumed that the land is available for this use at essentially no charge since, presumably after fill and development, the value of the land for sale or other use should be at least what it was initially The unit cost (dredging, transportation and disposal) is always least for land disposal compared with the other alternatives considered. However, if it were assumed that land must be acquired for the purpose of disposal of dredged material and that the purchase price is $30,000 per acre, the land disposal unit cost might be greater than the cost for disposal in a containment facility.

Long Island Sound Disposal

The critical assumption of the alternative method of disposal in Long Island Sound is that a site is available approximately 10 miles from the area of dredging activity. The disposal site is assumed to be an average distance of 10 miles from all dredging sites associated with a particular containment facility. In all cases it is assumed that clamshell dredging occurs and the dredged material is transported to the disposal site by barge. Based on the Statement of Work, for comparative purposes, a unit cost is computed for the dredging and transportation and is therefore, a fixed value of $4.20/cu yd that will not vary with the dredging associated with different containment facilities.

Open Ocean Disposal

The assumptions for open ocean disposal are similar to those for disposal in Long Island Sound with the exception that the disposal site is assumed to be an average distance of 100 miles offshore from the dredging activity. With the assumptions of clamshell dredging and barge transport, a fixed unit cost of $6.60/cu yd is obtained for comparison with costs of other disposal options.

The basic cost factors that are common to all sites and are used in the costing computations are given in Table 9-2. These cost factors are discussed in Section 11.0.

In addition to these basic cost factors there are a number of site specific characteristics that significantly affect the total and unit costs associated with a given prototype containment facility.

TABLE 9-2

COST FACTORS USED IN COMPUTATIONS

Operation	Cost
Hydraulic Dredging	$ 1.00/cu yd
Clamshell Dredging	$ 1.50/cu yd
Barge Transportation to 10 Miles	$ 2.70/cu yd
Barge Transportation to 100 Miles	$ 5.10/cu yd
Temporary Pipeline Transportation	$ 0.325 mil /mile*
Open Water Dike Construction	Cost/mile = $(1.5\,H^2 + 10H)\ \$2374 + K_1HT_1 + K_2HT_2$
Sheltered Water Dike Construction (Beach)	Cost/mile = $(1.0H^2 + 10H)\ \$2347 + K_2HT_1 + K_2HT_2$, where T_2 = sheltered riprap thickness (ft), K_2 = $6914 and $K_1 = \begin{cases} \$\ 10{,}932, & T_1 = 1\text{-}2 \text{ ft} \\ \$\ 52{,}565 & T_1 = 4 \text{ ft.} \end{cases}$
Containment Facility Operation	$ 50,000/year
Acquisition of Land for Land Disposal	Nothing or $ 30,000/acre
Construction and Operation of Land Disposal	$ 0.50/cu yd

*This represents a 30% increase over the usual cost of $0.25 mil/mile to reflect the requirements of a booster pump for the 3-mile transportation distance.

Table 9-3 presents the pertinent overall physical characteristics of the containment facility (dike length and height and containment facility area and capacity) as well as the time period estimated for filling the facility and the source of dredged materials. Additional special characteristics are noted. In the case of the prototype containment facility at Twotree Island, the period of disposal from seven dredging sites lasts 30 years. All 3,408,000 cu yd of material is received by barge after clamshell dredging at individual sites. The closest dredging site is Niantic Harbor, about two miles from the containment facility and the dredging site furthest away is Guilford Harbor, a distance of 28 miles. Over 42 percent of the dredged material comes from New London Harbor, about six miles away.

TABLE 9-3

TWOTREE ISLAND CONTAINMENT FACILITY CHARACTERISTICS

Item	Units	Hydraulic Dredging Scenario
Containment Facility Dike Length	ft	7700 (external) 1500 (internal)
Containment Facility Dike Height	ft	40
Containment Facility Exposed Surface Slope	--	1:2
Containment Facility Riprap Thickness or Exposed Surface	ft	4
Containment Facility Area	acres	80
Containment Facility Capacity	cu yd	3,400,000
Period of Disposal	yr	30
Source and Amount of Dredged Material	cu yd	
Pawcatuck River (18 miles)		270,000
Mystic River (12 miles)		135,000
New London Harbor (6 miles)		1,446,000
Niantic Harbor (2 miles)		324,000
Pauchoque River (15 miles)		621,000
Clinton Harbor (21 miles)		249,000
Guilford Harbor (28 miles)		363,000
Total Dredged Material	cu yd	3,408,000
Special Remarks: Island Containment Facility with a 2:1 slope on exposed surface of rubble mound dike.		

A comparison of the total cost and unit costs obtained for each disposal alternative is given in Table 9-4. Cost analysis indicates the most economical method of disposing of dredged material from the seven dredging sites to be land disposal. This conclusion, however, is dependent on the availability of land at no cost within one mile of dredging, which may not be possible. A total of approximately 211 acres would be needed assuming an average fill depth of 10 feet.

TABLE 9-4

COMPARISON OF COSTS OF ALTERNATIVE METHODS OF DISPOSAL
WITH DISPOSAL AT TWOTREE ISLAND CONTAINMENT FACILITY

Disposal Method	Dredging Method	Transport Method	Costs ($ Millions)					Unit Cost ($/cu yd)
			Dredging	Transport	Construct.	Disposal	Total	
Containment Facility	1. Hydraulic 2. Clamshell 3. Hydraulic (%) Clamshell (%)	Pipe (mi) Barge (12 mi) Pipe (mi) Barge (mi)	5.112	9.450	22.397	1.500	38.459	11.28
Land	4. Hydraulic	Pipe (1 mi)	3.408	1.750	-	1.704	6.862	2.01
Long Island Sound	5. Clamshell	Barge (10 mi)	5.112	9.202	-	-	14.314	4.20
Ocean	6. Clamshell	Barge (100 mi)	5.112	17.381	-	-	22.493	6.60

If a $30,000/acre cost of land acquisition is assumed, the unit cost of land disposal would be $3.87/cu yd rather than the $2.01/cu yd computed under the assumption of no-cost land availability. Land disposal, however, would still be far more economical economical than disposal in the proposed containment facility.

The unit cost of disposal at the Twotree Island Containment Facility is $11.28/cu yd. This is considerably more than the unit cost for disposal in Long Island Sound or open ocean disposal. It must be kept in mind, however, that the unit cost for the containment facility is dominated by construction costs which account for 58 percent of the total cost. Significant increases or decreases in the cost of construction of the dike at the Twotree Island would greatly alter the resultant unit cost.

9.6 Summary

The 3.4 million cu yd island containment facility three-quarters of a mile off the Waterford coastline will be created by a 7700 ft long dike rising 20 ft above an average depth of 20 ft at Mean Low Water. The exposed surface will be faced with four feet of riprap on a 2:1 slope. The 80-acre facility would be built around an existing ledge that barely rises above the water surface and may be considered a hazard to boating and ships. The facility would be divided into two cells by a 1500-ft interior dike of 1:1 slope surfaced by one foot of riprap. The planned final use of the site is for passive recreation and the area would be a refuge for birds and other coastal animals. This site is being given consideration at the suggestion of local conservationists. The most significant adverse impact would be the elimination of a scallop fishing area. The man-made island will ultimately appear similar to, but larger than, Pine Island and Bushy Point island, off Avery Point.

Dike construction will take place during a nine-month period from March through November. No night work is anticipated at any time. The dike will require about 810,000 cu yd of material transported by truck from inland borrow pits to New London Harbor and thence by barge to the containment facility site location. An alternative might be to use rail cars to haul dike material to New London Harbor. Dredged material, extracted by clamshell, could be barged to the facility from seven harbors and river mouths within 30 miles. Placing 3.4 million cu yd of dredged material in the Twotree Island containment facility is expected to take up to 30 years.

The unit cost of disposal at the Twotree Island prototype dredged material containment facility is $11.28/cu yd, which is much greater than either disposal in Long Island Sound ($4 20/cu yd) or open ocean disposal ($6.60/cu yd). Land disposal is the most economical disposal method at $2.00/cu yd, if it is assumed that land for fill is available at no cost within one mile of all dredging no dikes or water treatment are required, and hydraulic dredging is carried out with transport of the dredged material by temporary pipeline to the disposal site. The unit cost for containment facility disposal is dominated by construction costs that account for 58 percent of the total cost. Significant increases or decreases in the cost of construction of the dike would greatly alter the resultant unit cost

9.7 References

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10.0 SITE ANALYSIS #6: BLACK LEDGE/NEW LONDON HARBOR

10.1 Introduction

This section presents the detailed results of the analysis of social and economic impacts associated with the construction and final use of a prototype dredged material containment facility at Black Ledge off the Groton shoreline. Short-term impacts during construction of dikes, filling with dredged material, dewatering, and final capping contouring and planting have been examined, as well as long-term impacts involving final use.

The background material essential for assessing impacts is summarized in Section 10.2. A scenario for the construction, filling and completion of the containment facility is given in Section 10.3. The short-term and long-term socioeconomic impacts are presented and evaluated in Section 10.4. The cost analysis is given in Section 10.5 and a summary of the most pertinent results is given in Section 10.6.

10.2 Background

The city of Groton is located on the east bank of the Thames River about 13 miles from the Connecticut-Rhode Island border. The city of Groton encompasses about 2.8 square miles. About 10,090 persons live in the city and this is a 12 9 percent increase in the population of the city from 1970. The population density is about 3300 persons per square mile (1,2).*

In 1980, 4344 housing units were located in the city, an increase of 34.4 percent between 1970 and 1980 (2). Access to the city of Groton is via Route I-95, Route 1 and Route 12. A high volume of commuter traffic utilizes city streets in getting to and from places of employment. Approximately 4500 taxable motor vehicles are assessed in the city (3). The tax rate in the city is 46.6 mills and a net taxable grand list of $185,620,690 was reported for the period ending October 1, 1980 (4). The mean per capita income in Groton was $4642 in 1975 (3). The two largest taxpayers in the city of Groton are General Dynamics Corp., which accounts for 36.7 percent of the tax revenue collected and Pfizer, Inc., which provides 25.9 percent of the taxes (1). General Dynamics and Pfizer, Inc., together employ a total of about 22,000 persons (5).

Several major industries are located near the harbor and receive commodities from piers, wharfs, or docks. The major industries are as follows:

- o Electric Boat Division of General Dynamics
- o Pfizer Co.
- o Thames Valley Steel Co.
- o Naval Underwater Laboratory

*Number refer to references at the end of this section.

Electric Boat manufactures, tests and launches submarines at their facility in Groton. The Pfizer Company produces pharmaceuticals and Thames Valley Steel ships steel assemblies by barge. The Naval Underwater Laboratory develops and tests special systems for sea uses. In addition to those industries adjacent to the harbor, several other receive commodities via transfer from seagoing vessels to barges at New London. The Dow Chemical Company and Connecticut Power and Light utilize the harbor for entry to up-river points

Numerous commercial enterprises are dependent upon the use of harbor facilities. These include the following:

- o Hel-Cat Dock: fishing, one charter boat plus supplies.
- o Whaling City Dredge and Dock: Towing service and marine construction.
- o New London Municipal Dock: Block Island and Fishers Island transients accommodated (fee).
- o State Pier Road Landing: 30-ft asphalt ramp.

The institutional uses of the harbor are listed below:

- o U.S. Coast Guard Stations: moorings.
- o U.S. Coast Guard Buoy Depot: moorings.
- o State er No. 1: receipt and shipment of domestic and foreign commodities.
- o Anchorage near the State Pier: U.S. Navy submarines.

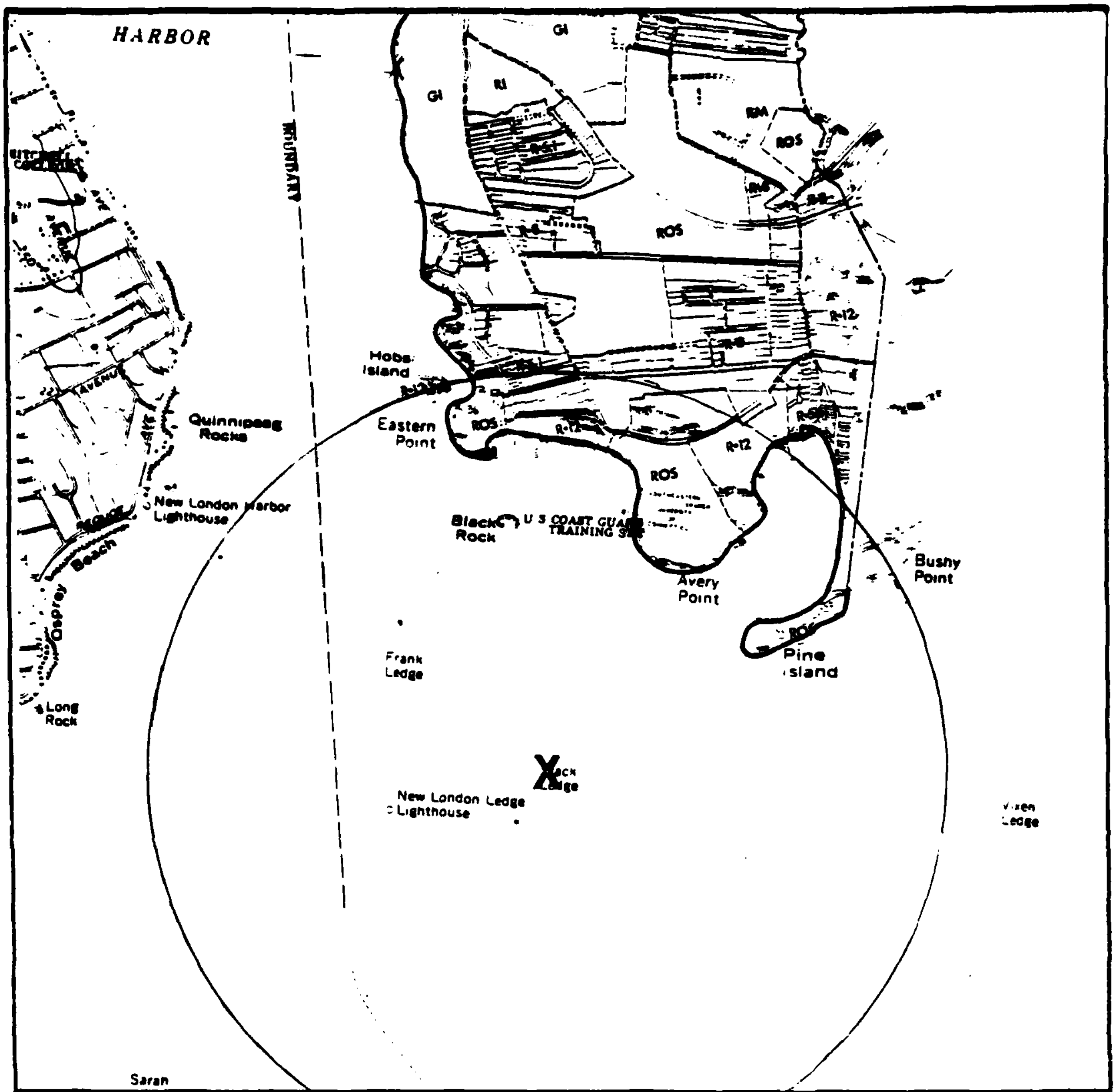
The New London Harbor is used for charter boats, pleasure craft, sailboats, swimming, fishing and water skiing. There are about a dozen marinas within the harbor having over 800 slips and over 50 moorings. Additional mooring areas are located near Greens Harbor. Several beaches are located near the entrance of the harbor. East Point in Groton is a town beach; Ocean Beach in New London is a town-owned beach; and Osprey Beach in New London is a private beach association facility (6).

Cultural resources in the city of Groton include a branch campus of the University of Connecticut which is used primarily as a marine research center, Project Oceanology, and the Coast Guard Research and Development Facility. All are located in close proximity to each other near Avery Point (7). Historical resources include Fort Griswold State Park and the Ebenezer Avery House located at Fort Griswold and the U.S.S. Crocker Submarine Memorial (8). Fort Griswold is listed in the National Register of Historical Places. Also of historic interest is the New London Lighthouse, which is currently undergoing renovation.

Land use in the city of Groton is a mix of residential, industrial, recreational, open space land containing public facilities and marine recreation; however, residential land use predominates in the area (9).

Approximately 880 persons live within the one-mile-radius primary impact area. The zoning map, Figure 10-1, shows designated land uses near the DMCF site. The area includes the extreme souther part of the city at Avery Point and Pine Island. Land use in the primary impact area consists of residential housing, recreation and open space and marine recreation. The Trumbull Airport is located outside of the primary impact area. The New London Lighthouse is located near a corner of the site. The branch campus of the University of Connecticut, Project Oceanology, and the Coast Guard Research and Development Center are in close proximity of the facility. It may be possible that either or both the UConn campus and Project Oceanology would take active interest in the development of the containment facility into a marine habitat.

Shennecossett Yacht Club Spicer's Marina and the State of Connecticut public launching ramp are marine recreation facilities located within the primary impact area. Numerous recreation vessels utilize the area around Black Ledge and some rerouting of boating activities is expected. The containment facility could provide added shelter to the marinas in the Avery Point area, by reducing their exposure to open water, especially during bad weather conditions.



LEGEND X - Approximate center of containment site.

R-12	RESIDENCE
R-8	RESIDENCE
R-5.1	RESIDENCE
R-5.2	RESIDENCE
RM	MULTI-FAMILY RESIDENCE
ROS	RECREATION-OPEN SPACE
LBR	LIMITED BUSINESS-RESIDENCE
GC	GENERAL COMMERCIAL
RI	RESTRICTED INDUSTRIAL
GI	GENERAL INDUSTRIAL

0 — 1 mile

BLACK LEDGE SITE

Figure 10-1. Zoning map for Black Ledge site.

10.3 Black Ledge Scenario

The objective of the Black Ledge/New London Harbor containment facility is to provide capacity for approximately 11 million cu yd of material, to be dredged from ew London Harbor and other Long Island Sound ports.

The final use of the 190-acre containment facility woiuld be as an island refuge for birds, and passive recreation, such as bird watching, etc. The perimeter of the man-made island will be approximately 12,000 feet, extending in a north-northeast direction from the New London Ledge Lighthouse at its southwest corner to Frank Ledge (an underwater prominence) at the northwestern tip. From there it will continue in a gentle arc along the southern side of Pine Island Channel to its northeastern corner, about 1700 feet due south of the western tip of Pine Island. At its nearest point, the containment facility will be 1800 feet from Avery Point. (For comparison, at its closest, Pine Island is 900 feet from Avery Point.) The facility will be 3300 feet (i.e., about 0.6 mi) from Shennecossett Beach. (For comparison, Black Rock is about 1100 feet south of the beach.) The location of the prototype containment facility is shown in Figure 10-2.

The containment facility would be enclosed with a 42-ft dike that is 20 feet above Mean Low Water. This is essentially the same elevation as the highest elevations on Pine Island and Bushy Point (island) to the northeast of the facility. The containment facility will have two interior cross-dikes, dividing into three cells, which will be filled sequentially To improve the aesthetic appearance of the facility, as each cell is completed, the dike height on the landward side will be lowered to 10 feet, and the dredged material will be sloped gently to the south about 200 feet and seeded and planted with low trees, to create a green, natural-appearing shoreline to viewers on the beach The dike would appear similar to the rocky waterline of Pine Island and Bushy Point (island).

The dike would be constructed of nearly 1.2 million cu yd of suitable material to be obtained from inland borrow pits, with the material trucked to a coastal location (probably nearby New London Harbor) and barged to the Black Ledge area. The outer face of the dike will be covered with a 4-foot layer of large stone riprap. (Inside dike faces have one foot of riprap.) Dike construction would take place during a nine-month period (March through November) of nearly 200 working days, based on a five-day working week. Approximately 6000 cu yd of dike material will be moved from borrow pits to a barge-loading facility each 10-hour working day, requiring 20 to 30 loads delivered per hour, depending on truck capacity. Such transportation rates are commensurate with typical earth movement for interstate highway construction. If

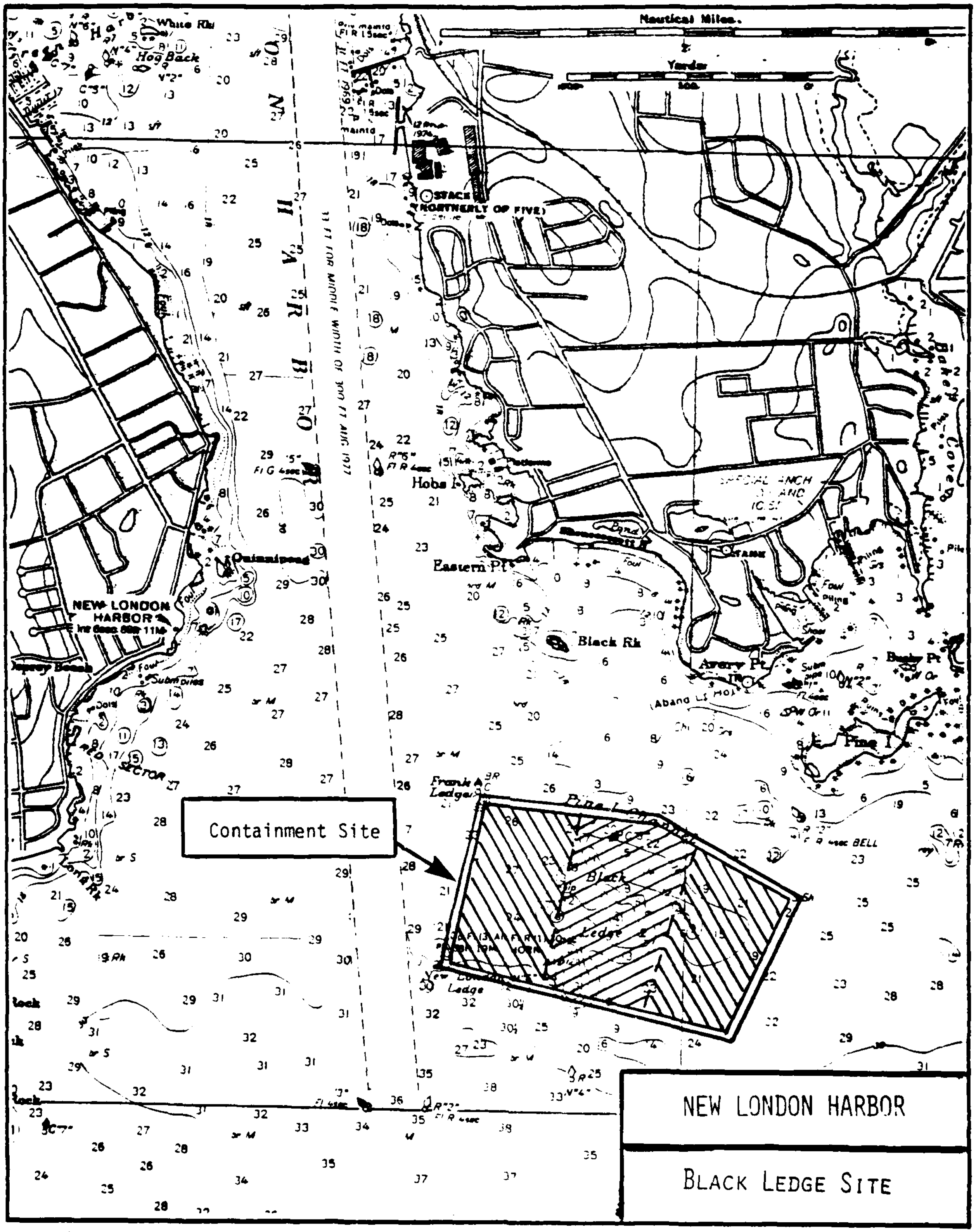


Figure 10-2. Proposed location of prototype dredged material containment facility.

the frequency of loads has adverse impact on the public, work could be conducted over two shifts each day (16 hours), which could result in about 15 loads per hour. Another alternative might be to use rail cars to haul the dike material to New London Harbor. Barges with a capacity of about 2000 cu yd or more will be used, implying four or fewer barge trips from the shore to the Black Ledge site each working day, or about one round trip every two hours or more, depnding on barge size. This frequency of barge trips is not expected to interfere significantly with summer recreational boating or commercial or military ship traffic

Filling the three containment cells would take 30 years or more. All material would be dredged by clamshell from nearby sites and barged to the containment facility There it would be dumped in the water of a transfer basin where a hydraulic dredge will remove the material from the basin and convey it by floating pipeline to various locations within the containment cells. As each 63-acre cell is filled, the surface will be gently contoured, with variations in final elevation of up to about 10 feet, and grass and low trees will be planted, thus providing variation in wildlife habitat. As noted above, to improve the aesthetic appearance, the shoreside dikes for each completed cell will be lowered from 20 to 10 feet and the dredged material behind it gently graded back 200 feet and planted. From Shennecossett Beach and Ocean Beach, the 117-foot prominence and other high points on the western tip of Fishers Island will be seen as before. From higher elevations such as Groton Heights and the residential area surrounding the Shennecossett Country Club, the almost 5-mile length of Fishers Island will continue to be the major visual point of interest, with the Black Ledge containment facility appearing essentially as an extension of the Pine Island-Bushy Point (island) "chain." Over the years, it is anticipated that this completed island could become a significant wildlife area.

10.4 Social and Economic Impact Analysis

Background

In undertaking Work Order No. 8 for NED/CE, CEM staff performed the analysis of potential impacts in four steps:

1. Review and analysis of 49 dredging/disposal permits issued by NED/CE for Connecticut projects in 1979 and 1980 including:
   - o Agency and general public objections.
   - o Mitigating measures incorporated by the applicant in a revised permit application, in response to formal objections and informal "suggestions" by agencies and the general public.
   - o Special conditions in the permits imposed by NED/CE in response to objections, "suggestions," and/or NED/CE policy.
2. Review of the literature and selection of social, environemntal, and economic attributes to be considered, including preparation of preliminary descriptions of each site.
3. On-site personal interviews and telephone contacts with opinion leaders and others to determine on-site public attitudes and review of NED/CE workshop responses
4. Preparation of more detailed scenarios for each containment facility, and subjective potential impact evaluation by CEM staff.

The results of the first step are presented in Section 4 of this report. The literature review is cited in Appendix A. Summaries of personal interviews and telephone contacts are given in Appendix B. Appendix E summarizes the written responses to four NED/CE workshops, held in May 1981, at New London, New Haven and Stamford, Connecticut, and Great Neck on Long Island.

Preliminary location maps were prepared for each facility, prior to conducting the public attitude survey. Discussions were held with NED/CE staff, based on preliminary results of the public attitude survey and cost analysis, and the more detailed scenarios were developed (see Section 10.3 above), taking into account many of the comments derived from the public attitude analysis and workshop responses.

Concurrent with the above work, CEM reviewed the literature on social, economic and environmental impact assessment. Using various sources, especially the Water Resources Assessment Methodology (WRAM) developed by the Corps of Engineers, and the Site Evaluation of Energy Conversion Systems (SELECS) methodology developed by CEM for the Department of Energy, five categories of impacts involving 22 attributes were chosen as being most appropriate for this social and impact analysis (10,11,12). Table 10-1 provides definitions of the 22 impact attributes.

TABLE 10-1

DEFINITIONS OF 22 IMPACT ATTRIBUTES

Category 1: LIFE, HEALTH, SAFETY

1. Boating Hazards: Those created by barges and support vessels during construction; and those due to containment areas.
2. Construction Hazards: Injuries to workers or to (illegal) visitors during dike building or during placing and grading dredged materials.
3. Final Use Hazards: Creating new land also creates a potential for more accidents as more people visit the site.
4. Traffic Congestion: The number of additional vehicles used during construction and final use is added to the number already present in the primary impact area.
5. Vectors (organisms which can carry and transmit disease): Norway rats and mosquitos are of concern.
6. Air Pollution: Particulate matter--especially dust from movement of dredged material that has been partially dewatered--is the principal pollutant to measure. Exhaust gases from various machines are also considered.

Category 2: COMMUNITY ORGANIZATION

7. Displacement of People: Need for road access during site construction may force relocation. Fishermen, and other commercial, industrial and recreational interests may suffer.
8. Zoning Compatibility: Final use of the site must agree with zoning regulations of the adjacent region. Potential for zoning waivers are considered.
9. Accessibility: Both physical (road access, elevated structures) and psychological (attractiveness of site) are considered.
10. Community Service: Increases in need and use of service personnel such as police, fire and maintenance persons.
11. Perceived Need for a Particular Final Use: What community persons feel and say about what their community needs or lacks the most.

Category 3: FINANCIAL

12. Land Value: Price of property surrounding or near a containment area may be affected; this will be considered.
13. Employment: The number of new jobs created by construction or by final use will be compared to those who are unemployed and are looking for jobs.

Category 4: EDUCATIONAL, CULTURAL, RECREATIONAL

14. Recreational Opportunities: Community population in relation to per capita recreational opportunity will be considered.
15. Educational Opportunities: Community size, number of projected visitors to the site, size of the site and "general educational enthusiasm" will be considered.
16. Proximity of a Cultural Resource: Are there theaters, museums, aquariums, universities or other landmarks close to the site?
17. Historical Significance: Sites in or similar to those in the *National Register of Historic Places* will be identified.

Category 5: AESTHETICS

18. Noise: Machinery used during construction and operation may add, temporarily, to noise level near the site.
19. Odors: Dredged material may contain sediments with organic composition that create odors dispersed by wind. The number of people in the primary impact area is of concern.
20. Exposure: This involves the number of people in in a community who might view and be visually affected by the containment area.
21. Compatibility: How does the proposed site fit in with what is around it? (This goes beyond the question of legal zoning requirements.)
22. Reduction in Panoramic View: Both the dike and the necessary operation equipment may interfere with the opportunities offered by shorelines for wide, unobstructed views.

The remainder of this section contains some of the more significant perceived impacts extracted from the public attitude survey and a subjective preliminary assessment of potential impacts. Because there were differences between the preliminary scenario used in the attitude survey and the more detailed scenario given in Section 10.3, many of the perceived impacts have parenthetical clarifying statements following them. Following next is an eight-page summary of the subjective impact analysis prepared by CEM staff, using the 22 impact attributes.

Perceived Major Social, Economic, and Environmental Impacts

CEM staff visited proposed dredged material containment facility sites and interviewed pertinent persons, such as first selectmen (i.e., mayors), harbor masters, marina operators, and other opinion leaders. In some instances, telephone interviews with other relevant persons were also accomplished (see Appendix B).

Many of those interviewed were acquainted with a list of 22 potential impact attributes compiled by CEM. They were provided with a preliminary estimate of the size and other characteristics of the proposed containment facility, but not the detailed scenario presented above, which was prepared after the first phase of this economic and social impact analysis was completed, and includes mitigating measures suggested by NED/CE. The more significant perceived impacts extracted from the public opinion survey are presented next.

The following summarizes the major impacts extracted from personal and telephone interviews. Clarifying comments responding to some of the perceived major impacts are included parenthetically

- o Recreational boat traffic from the Pine Island Bay area, as well as the Block Island Ferry, would be forced to alter their routes into the heavily used main channel, although some marinas may receive some storm protection in return.
- o The site will have to absorb high wave and current energy compared to other possible locations along the Thames River, north of the interstate highway. (The site is expected to be engineered to withstand high wind, wave and current forces.)
- o Use of the site for other than either a wetland or a wildlife refuge would be unacceptable. (The site is expected to be a wildlife habitat.)

- o A historical landmark, the New London Channel Lighthouse, is located on a corner of the proposed site (the southwest) and is presently being extensively renovated by the Coast Guard. For further details, refer to Ms. Sue Hart, New York Coast Guard, Third District). (The site is nnot expected to disturb the lighthouse.)
- o Hard clams, pitar, and lobsters are found throughout the Black Ledge area.
- o Many residents in the city of Groton are concerned about the waterfront; the town beach was recently riprapped to prevent erosion, but in a short time turned to mud; assurance by detailed study should be done so that there will be no increased sedimentation. (A circulation study is expected to be performed.)
- o The size of the site may create a lure to the curious, although accessibility is limited to vessels only. The site is outside of police jurisdiction, and the local Coast Guard may not be able to provide the required long-term surveillance. (Problems will be no different from those of nearby Pine Island and Bushy Point).
- o There could be an acute, though temporary order problem, primarily from hydrogen sulfide gas. (Material will be placed only in Spring and Fall.) It will be underwater until dewatered; then it will be capped with clean material.)
- o Over 100,000 people/year will be able to see the site when completed. (It will appear similar to the extensive neighboring marsh.)
- o Trucks or loud machinery should not be operated at night past local ordinances, unless special mufflers are used. (No night work is anticipated.)
- o Adequate tidal circulation must be planned fro a marsh to flourish, and there will probably be many questions about this by informed citizens. (Circulation channels similar to the adjacent existing marsh will be created.)
- o More than 25 percent of the panoramic view may be disrupted. (The 24-acre site will be smaller and lower than initially conceived.)

Results of Subjective Analysis of Potential Impacts

In arriving at subjective judgments concerning the level of potential impacts that might stem from implementation of this prototype dredged material containment facility consideration was given to short-term impacts associated with the construction, filling, capping and final shaping and seeding of the containment facility, and to long-term impacts that would occur after the facility is completed and is in use. Impacts were assigned both for the primary region within a one-mile radius of the facility, and in the secondary impact region of one to five miles radius about the site. Recent low altitude aerial color photography of the site and its surrounding region, as

well as maps, personal ground visits and results of personal interviews and telephone contacts, were used as aids in the final process of arriving at judgmental decisions for the level of impacts that may occur.

The impact analysis occurred in three phases. First, a preliminary assessment was made, based on the public attitude response to the preliminary scenario, which described only the physical characteristics of the tentatively conceived prototype containment facility. The preliminary assessment was communicated to NED/CE, along with a more detailed draft scenario that included mitigating measures responsive to many of the significant potential impacts perceived by the public. The scenario presented in the section above was coordinated with NED/CE and then used along with all other pertinent information and data as a basis for the potential impact assessment presented in the following tabular form.

It is emphasized that detailed design, geological and benthic field tests, an environmental impact statement, and a series of public meetings will be accomplished before implementation can begin. It is also important to note that Congress must review and appropriate funds for each project. Thus, many of the potential impacts described here may be subject to further mitigating measures before implementation of a prototype dredged material project begins.

SITE: BLACK LEDGE/NEW LONDON HARBOR

PRIMARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Large	Many vessels in channel; Block Island Ferry and recreational boats forced into channel.
• Construction Hazards	Moderate	Large volume of dike fill to be transported to and deposited at site. However, site accessible to boaters only.
• Final Use Hazards	Not applicable Short-term	
• Traffic Congestion	Large	Only if dike material is trucked to barge dock. Negligible if rail used.
• Vectors	Negligible	Large acreage, but reasonably far from shore--some mitigation may be required.
• Particulates	Negligible	Island about 1/2 mi from land; duration temporary; small areas of active work.
2. COMMUNITY ORGANIZATION		
• Displacement	Large	Lobsters and clams have been reported on or near site.
• Zoning Compatibility	Not applicable Short-term	
• Accessibility	Negligible	By vessel only
• Community Services	Moderate	Not clear if outside local police jurisdiction. Contractor should arrange for hospital services for anyone injured at site.
• Perceived Need	Not applicable Short-term	

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	Negligible	Even a house built near Hobbs Island recently had no effect; construction temporary.
• Employment	Moderately beneficial	Especially if a local company does the dredging.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Moderate	Construction/filling activities may interfere with recreational boating.
• Educational Opportunities	Small	Can be reached only by boat. The size will attract a segment of the boating population.
• Cultural Resources	Small	Ocean Beach in New London, and UConn branch campus and Coast Guard research center at Avery Point. (See Appendix F.)
• Historical Significance	Moderate	New London Ledge Lighthouse near site corner is currently being renovated and manned. Listed in the National Register.
5. AESTHETICS		
• Noise	Moderate	Assumes no construction done at night.
• Odors	Negligible	Site remote from land; will be filled in increments; material under water most of time.
• Exposure	Moderate	Ocean Beach just inside 1 mile radius. Avery Point has about 800 people, and visitors.
• Compatibility	Moderate	Large machinery obtrusive, especially from Eastern Point to Avery Point.
• Panoramic View	Large	The dike will be 20 ft above MLW,similar to adjacent natural islands.

SITE: BLACK LEDGE/NEW LONDON HARBOR SECONDARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Moderate	Material probably brought by barge outside one mile.
• Construction Hazards	Moderate	Location of source for dike material not yet determined. Assumes trucking of material.
• Final Use Hazards	Not applicable Short-term	
• Traffic Congestion	Moderate	If trucks are used; otherwise none.
• Vectors	Negligible	No problem resulting from site expected for whole community.
• Particulates	Negligible	Some dust--primarily from trucks if utilized.
2. COMMUNITY ORGANIZATION		
• Displacement	None	
• Zoning Compatibility	Not applicable short-term	
• Accessibility	Negligible	Access only by water--few visitors expected from secondary impact area.
• Community Services	None	
• Perceived Need	Not applicable Short-term	

SITE: Black Ledge (continued) SECONDARY IMPACT AREA / SHORT-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	
• Employment	Negligible	Duration temporary.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Small	Construction and disposal operations not scheduled during recreation season.
• Educational Opportunities	Negligible	A few curious boaters may visit the site.
• Cultural Resources	Negligible	
• Historical Significance	Negligible	
5. AESTHETICS		
• Noise	Negligible	None expected to exceed 70 db for any considerable duration.
• Odors	None	
• Exposure	Moderate	Many beaches, beach clubs, and homes on hillsides.
• Compatibility	Negligible	Obtrusive character of machinery reduced by distance.
• Panoramic View	Moderate	Site will be observable beyond one mile.

SITE: BLACK LEDGE/NEW LONDON HARBOR PRIMARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	Moderate	More boats will be forced into channel than by existing underwater ledges. Reduced size would mitigate.
• Construction Hazards	Not applicable Long-term	
• Final Use Hazards	Moderate	High dike with large riprap surface would make visits by people somewhat hazardous.
• Traffic Congestion	None	
• Vectors	Negligible	Site should be carefully drained.
• Particulates	Negligible	No significant quantity after grass planted.
2. COMMUNITY ORGANIZATION		
• Displacement	Large	Displaces lobster and clam beds.
• Zoning Compatibility	Negligible	Not zoned, but acceptable as open space or wildlife sanctuary.
• Accessibility	Moderate	Only boats have access but size will continue to attract the curious--though no more than other nearby natural islands.
• Community Services	Moderate	Site outside police jurisdiction and emergency arrangement should be made.
• Perceived Need	Moderate	Site recommended by local conservation group for expanding available wildlife habitat.

SITE: Black Ledge (continued) PRIMARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	None expected, even recent house near Hobbs Island had no effect.
• Employment	Negligible	Possible maintenance jobs.
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Negligible	Unless plans made to use site as park.
• Educational Opportunities	Moderate beneficial	Development as island habitat.
• Cultural Resources	Moderate	Avery Point has UConn branch campus Coast Guard research center and Ocean Beach Park just inside primary impact area and could be adversely affected by altered aesthetics.
• Historical Significance	Small	Precautions must be taken to insure the historical characteristics of New London Ledge Lighthouse.
5. AESTHETICS		
• Noise	None	
• Odors	None	None from site after material dries out and is capped.
• Exposure	Moderate	Several beach sites in area.
• Compatibility	Large	Area character modified by the 190-acre man-made island. Smaller facility would mitigate impact.
• Panoramic View	Large	Dike is 20 ft above MLW. Area is large;Avery Pt only 0.[illegible] mi away. It will appear similar [illegible] adjacent natural islands.

SITE: BLACK LEDGE/NEW LONDON HARBOR SECONDARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
1. LIFE, HEALTH, AND SAFETY		
• Boating Hazards	None	
• Construction Hazards	Not applicable Long-term	
• Final Use Hazards	None	
• Traffic Congestion	None	
• Vectors	None	
• Particulates	None	
2. COMMUNITY ORGANIZATION		
• Displacement	None	
• Zoning Compatibility	None	
• Accessibility	Negligible	
• Community Services	None	
• Perceived Need	Moderate	Desirable addition to wildlife habitat.

SITE: Black Ledge (continued) SECONDARY IMPACT AREA / LONG-TERM

CATEGORY/ATTRIBUTE	DEGREE OF SEVERITY	RATIONALE
3. FINANCIAL		
• Land Value Changes	None	
• Employment	Negligible Beneficial	
4. EDUCATIONAL, CULTURAL, AND RECREATIONAL		
• Recreational Opportunities	Negligible beneficial	
• Educational Opportunities	Negligible beneficial	
• Cultural Resources	Negligible	
• Historical Significance	Negligible	
5. AESTHETICS		
• Noise	None	
• Odors	Not Applicable	
• Exposure	Negligible	
• Compatibility	Negligible	
• Panoramic View	Negligible	People in secondary impact area are outside view area.

Black Ledge Site

The large volume of dike material required at the Black Ledge DMCF may result in significant traffic congestion and construction hazards during the short-term. Boating hazards associated with vessel movements to and from the DMCF during development and operation (i.e., dredged material placement) may result because of the large volume of recreational and commercial boat traffic at the entrance to New London Harbor. The long operating life of the facility would extend these concerns over time. Displacement of lobsters and clams would unavoidably result from the island creation. Aesthetic impacts relate to visual exposure of the site from shorelands. Although the site is some distance offshore (i.e., 1800 feet from Avery Point), its large size would reduce the panoramic view from shorelands. The DMCF island, however, would be similar in appearance to other nearby islands.

The issue of jurisdiction of created lands was identified for the Black Ledge site as with the Twotree Island site off Waterford. Local authorities are concerned that the DMCF would be an attractive nuisance to area boaters which would be difficult to supervise.

Creation of the DMCF at the Black Ledge site is viewed by some as a valuable addition to wildlife habitat in the area, and would provide opportunities for passive recreation and environmental education. The site has been recommended by a local conservation group.

10.5 Site Cost Analysis

Before discussing the specific cost elements of this containment facility it is useful to consider some of the assumptions and characteristics that are present in the different disposal methods--containment facility land disposal within one mile of the dredging site, disposal in Long Island Sound 10 miles from the dredging area and disposal in the open ocean about 100 miles from the dredging location.

Containment Facility

If the dredging site is within two miles of the containment facility it is usually assumed that hydraulic dredging can occur and the material is transported to the facility through temporary pipeline. In the case of the facility at Black Ledge, it is assumed that only clamshell dredging will occur in New London Harbor even though significant portions of the harbor and entrance channel are within two miles of the facility. Navigational problems and current conditions make the use of temporary pipelines a serious difficulty. If the dredging site is further than two miles, it is assumed that clamshell dredging occurs and the material is transported by barge. The dredged material is deposited in a small transfer basin at a dike containment facility and then hydraulically pumped to various locations within the facility to fill it. The total cost of disposal of dredged material in the containment facility is computed from the sum of the costs of dredging, transportation construction of the containment facility and operation of the containment facility during disposal of material.

Land Disposal

A critical assumption in this alternative is that land is available within one mile of each of the dredging sites that are included in the service area of a containment facility This is certainly a very questionable assumption given the reality of environmental constraints and social attitudes prevalent in some communities in the Long Island Sound region However, land disposal, especially for maintenance dredging of rivers and small harbors with clean material and small volumes, continues to be a viable economic option. Given the availability of land, hydraulic dredging is then assumed with pipeline transportation of dredged material.

The total cost of land disposal is strongly influenced by assumptions made concerning the possible cost of obtaining the land for use for disposal of dredged material. It is assumed that the land is available for this use at essentially no charge since, presumably after fill and development, the value of the land for sale or other use should be at least what it was initially The unit cost (dredging, transportation and disposal) is always least for land disposal compared with the other alternatives considered. However, if it were assumed that land must be acquired for the purpose of

disposal of dredged material and that the purchase price is $30,000 per acre, the land disposal unit cost might be greater than the cost for disposal in a containment facility

Long Island Sound Disposal

The critical assumption of the alternative method of disposal in Long Island Sound is that a site is available approximately 10 miles from the area of dredging activity The disposal site is assumed to be an average distance of 10 miles from all dredging sites associated with a particular containment facility. In all cases it is assumed that clamshell dredging occurs and the dredged material is transported to the disposal site by barge. Based on the Statement of Work, for comparative purposes, a unit cost is computed for the dredging and transportation and is, therefore, a fixed value of $4.20/cu yd that will not vary with the dredging associated with different containment facilities.

Open Ocean Disposal

The assumptions for open ocean disposal are similar to those for disposal in Long Island Sound with the exception that the disposal site is assumed to be an average distance of 100 miles offshore from the dredging activity. With the assumptions of clamshell dredging and barge transport, a fixed unit cost of $6.60/cu yd is obtained for comparison with costs of other disposal options.

The basic cost factors that are common to all sites and are used in the costing computations are given in Table 10-2. These cost factors are discussed in Section 11.0.

In addition to these basic cost factors there are a number of site specific characteristics that significantly affect the total and unit costs associated with a given prototype containment facility

Table 10-3 presents the pertinent overall physical characteristics of the containment facility (dike length and height and containment facility area and capacity) as well as the time period estimated for filling the facility and the source of dredged materials. Additional special characteristics are noted. In the case of the prototype containment facility at Black Ledge, the period of disposal of dredged material from seven sites is 97 years. This extremely lengthy period could be reduced by (1) transporting dredged material from coastal sites much further away than 30 miles to the containment facility, (2) accepting dredged material from the Connecticut River and Upper Thames River, (3) depositing a greater portion of dredged material from improvement dredging (in this scenario, 10 percent of this dredged material is included), or (4) reducing the area and capcity of the facility.

TABLE 10-2

COST FACTORS USED IN COMPUTATIONS

Operation	Cost
Hydraulic Dredging	\$ 1.00/cu yd
Clamshell Dredging	\$ 1.50/cu yd
Barge Transportation to 10 Miles	\$ 2.70/cu yd
Barge Transportation to 100 Miles	\$ 5.10/cu yd
Temporary Pipeline Transportation	\$ 0.325 mil /mile*
Open Water Dike Construction	Cost/mile = $(1.5\ H^2 + 10H)\ \$2374 + K_1HT_1 + K_2HT_2$
Sheltered Water Dike Construction (Beach)	Cost/mile = $(1.0H^2 + 10H)\ \$2347 + K_2HT_1 + K_2HT_2$, where T_2 = sheltered riprap thickness (ft), K_2 = \$6914 and $K_1 = \begin{cases} \$\ 10{,}932, & T_1 = 1\text{-}2\ \text{ft} \\ \$\ 52{,}565 & T_1 = 4\ \text{ft.} \end{cases}$
Containment Facility Operation	\$ 50,000/year
Acquisition of Land for Land Disposal	Nothing or \$ 30,000/acre
Construction and Operation of Land Disposal	\$ 0.50/cu yd

*This represents a 30% increase over the usual cost of \$0.25 mil/mile to reflect the requirements of a booster pump for the 3-mile transportation distance.

TABLE 10-3

BLACK LEDGE CONTAINMENT FACILITY CHARACTERISTICS

Item	Units	Hydraulic Dredging Scenario
Containment Facility Dike Length	ft	12,000 (external) 2,700 (internal)
Containment Facility Dike Height	ft	42
Containment Facility Exposed Surface Slope	--	1:2
Containment Facility Riprap Thickness or Exposed Surface	ft	4
Containment Facility Area	acres	190
Containment Facility Capacity	cu yd	11,000,000
Period of Disposal	yr	97
Source and Amount of Dredged Material	cu yd	
Pawcatuck River (13 miles)		873,000
Mystic River (7 miles)		436,500
New London Harbor (1 mile)		4,675,400
Niantic Harbor (7 miles)		1,047,600
Pauchoque River (20 miles)		2,007,900
Clinton Harbor (25 miles)		805,100
Guilford Harbor (32 miles)		1,173,700
Total Dredged Material	cu yd	11,019,200
<u>Special Remarks:</u> Island Containment Facility with a 2:1 slope on exposed surface of rubble mound dike.		

All of the 11,019,200 cu yd of dredged material is received by barge after clamshell dredging at individual sites. The closest dredging site is New London Harbor and the most distant site is Guilford Harbor, 32 miles away. Over 42 percent of the dredged material comes from New London Harbor.

A comparison of the total cost and unit costs obtained for each disposal alternative is given in Table 10-4. Cost analysis indicates the most economical method of disposing of dredged material from the seven dredging sites to be land disposal. This conclusion however, is dependent on the availability of land at no cost within one mile of dredging, which may not be possible. Approximately 682 acres would be needed assuming an average fill depth of 10 feet.

TABLE 10-4

COMPARISON OF COSTS OF ALTERNATIVE METHODS OF DISPOSAL WITH DISPOSAL AT BLACK LEDGE CONTAINMENT FACILITY

Disposal Method	Dredging Method	Transport Method	Costs ($ Millions)					Unit Cost ($/cu yd)
			Dredging	Transport	Construct.	Disposal	Total	
Containment Facility	1. Hydraulic 2. Clamshell 3. Hydraulic (%) Clamshell (%)	Pipe (mi) Barge (11 mi) Pipe (mi) Barge (mi)	16.529	31.146	38.000	4.850	90.525	8.22
Land	4. Hydraulic	Pipe (1 mi)	11.019	1.750	-	5.510	18.279	1.66
Long Island Sound	5. Clamshell	Barge (10 mi)	16.529	29.752	-	-	46.281	4.20
Ocean	6. Clamshell	Barge (100 mi)	16.529	56.198	-	-	72.727	6.60

If a $30,000/acre cost of land acquisition is assumed, the unit cost of land disposal would be $3.52/cu yd rather than the $1.66/cu yd computed under the assumption of no-cost land availability.

The unit cost of disposal at the Black Ledge Containment Facility is $8.22/cu yd This is considerably more than the unit cost for disposal in Long Island Sound but only 25 percent higher than open ocean disposal. It must be kept in mind, however, that the unit cost for the containment facility is strongly affected by construction costs which account for almost 42 percent of the total cost. Significant increases or decreases in the cost of construction of the dike at the Black Ledge facility would greatly alter the resultant unit cost.

10.6 Summary

The 11.0 million cu yd island containment facility within 2000 feet of Avery Point will be created by a 12,000 ft long dike rising 20 ft above an average depth of 22 ft at Mean Low Water. The exposed surface of the dike will be faced with four feet of riprap on a 2:1 slope. The 190-acre facility would be built around a submerged ledge that presents a navigation hazard to large vessels. The facility would be divided into three cells by 2700 ft of interior dikes with a 1:1 slope and one foot of riprap. The final use of the site is for passive recreation and the area would be a refuge for birds and other coastal animals. The location of the site was suggested by local conservationists. A number of adverse impacts may occur. These include (1) traffic congestion during the dike construction period if material is hauled by truck from inland borrow pits; (2) effects on boating and large vessels because of heavy barge traffic bringing material to the facility; (3) displacement of shellfishing grounds; and (4) alteration of panoramic view. The facility in final form would appear similar to. but much larger than, nearby Pine Island and Bushy Point island.

Dike construction will occur during the nine-month period of March through November. The dike will require 1.2 million cu yd of material transported by truck from inland borrow pits.

The unit cost of disposal at the Black Ledge dredged material containment facility is $8.22/cu yd, which is considerably more than disposal in Long Island Sound ($4.20/cu yd) but only 25 percent more than open disposal ($6.60/cu yd). Land disposal is the most economical disposal method at $1.66/cu yd if it is assumed that land for fill is available at no cost within one mile of all dredging no dikes or water treatment are required, and hydraulic dredging is carried out with transport of the dredged material by temporary pipeline to the disposal site. The unit cost for containment facility disposal is dependent on the assumption of all fill material coming from clamshell dredging at seven harbors and river mouths within 30 miles and barge transportation of the dredged material. The unit cost is also strongly affected by the cost of dike construction which account for 42 percent of the total cost. Significant increases or decreases in the cost of construction would greatly alter the unit cost.

10.7 References

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2. State of Connecticut Office of Policy and Management. 1980 Advanced Census Population and Housing Tables for Connecticut. Connecticut Census Data Center, Hartford, CT, March 1981.

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8. Connecticut Department of Economic Development. 1980/81 Connecticut Vacation Guide. Conn. Dept. of Economic Development, Tourism Division, Hartford, CT, 1980.

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11. Northrop, G. M., et al., CEM Report 4231-625, Environmentally-Acceptable Fossil Energy Site Evaluation and Selection: Methodology and User's Guide, Vol. 1. The Center for the Environment and Man, Inc., Hartford, CT, February 1980.

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11.0 COST ANALYSIS

The methodology to perform an analysis of the cost efficiency of each of the proposed containment sites is based on a set of fairly simple assumptions regarding the costs of dredging and alternative methods of disposal. The results for the individual containment structures and comparisons with alternative disposal methods are determined by the following factors: method and cost of dredging; method and cost of transportation of dredged materials; containment facility type and capacity and costs of construction and operation; dredged material available from individual sites and time period of interest; service area encompassing individual dredging sites that is associated with each containment facility; and costs of land acquisition (if any) and operation for land disposal. The figures used for dike lengths, volumes, heights, etc., were specified by NED/CE and are believed to be maximums.

No attempt has been made to develop a comprehensive methodology that would optimize the choice of dredging alternatives from a regional perspective. Obviously, some regional overtones are evident when one goes through the process of matching individual dredging sites to proposed containment facilities or when one considers the containment facility capacities in comparison with projected dredging requirements over a given time period. However, the basic intent is to conduct individual analyses of each containment facility in a consistent way that permits some comparisons to be made at the same time without becoming involved in the complex detail of an optimization analysis of regional scope--a facet outside the scope of this study.

11.1 Costing Methodology

The major assumptions in the costing of dredging and disposal operations are listed below.

1. The cost of dredging at individual sites is computed at $1.50 per cubic yard (cu yd) for clamshell dredging and $1.00/cu yd for hydraulic dredging. The data provided to CEM by NED/CE (1)* for total project unit cost for hydraulic and clamshell dredging in Connecticut is shown graphically in Figures 11-1 and 11-2. The figures clearly illustrate the well-known fact of very great variability in dredging costs among different projects. In addition to large variations in total cost, the fraction of the cost that is due to the dredging component (as separated from transportation and disposal) also varies greatly. The figures of $1.50/cu yd for clamshell dredging and $1.00/cu yd for hydraulic dredging reflect the data in Figures 11-1 and 11-2 and the assumptions that (a) the contractor with the lowest bid would be

*Numbers refer to references at the end of this section.

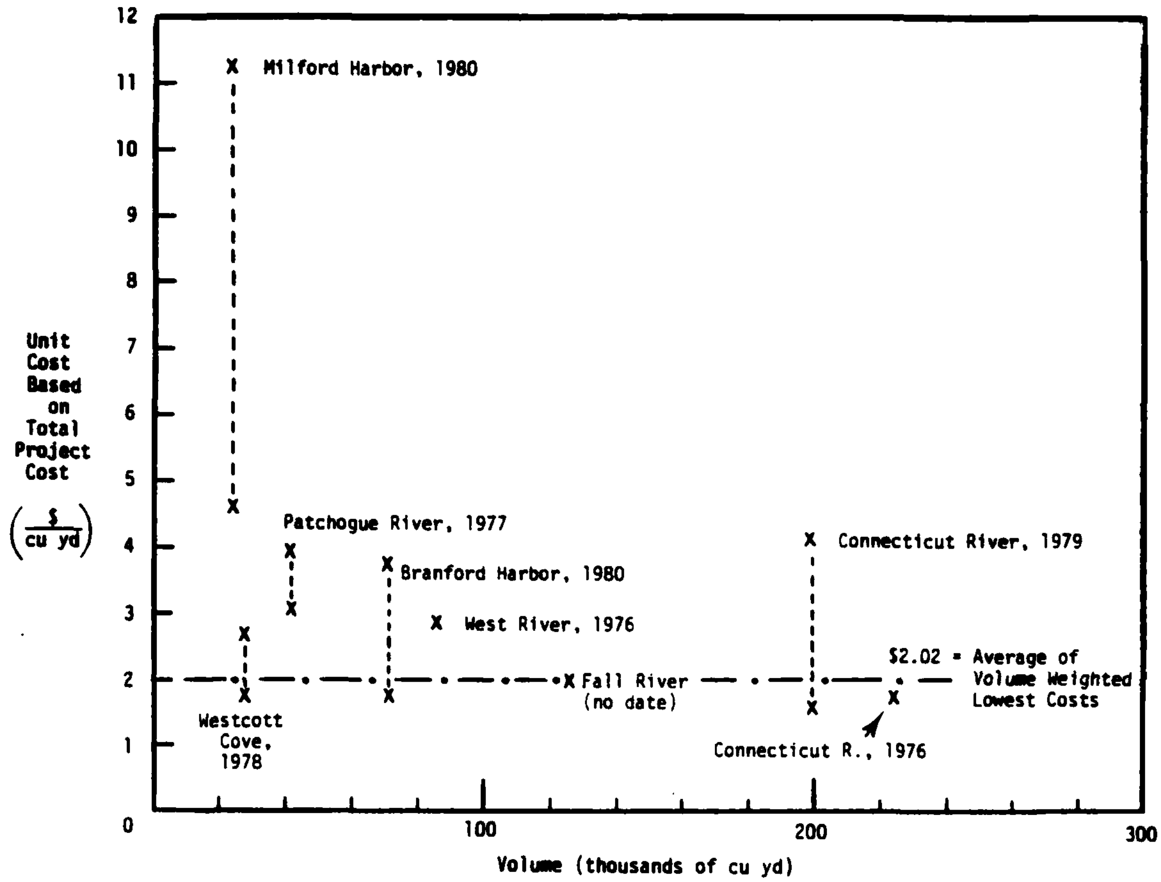

Figure 11-1. Bid costs of hydraulic dredging projects in Connecticut.

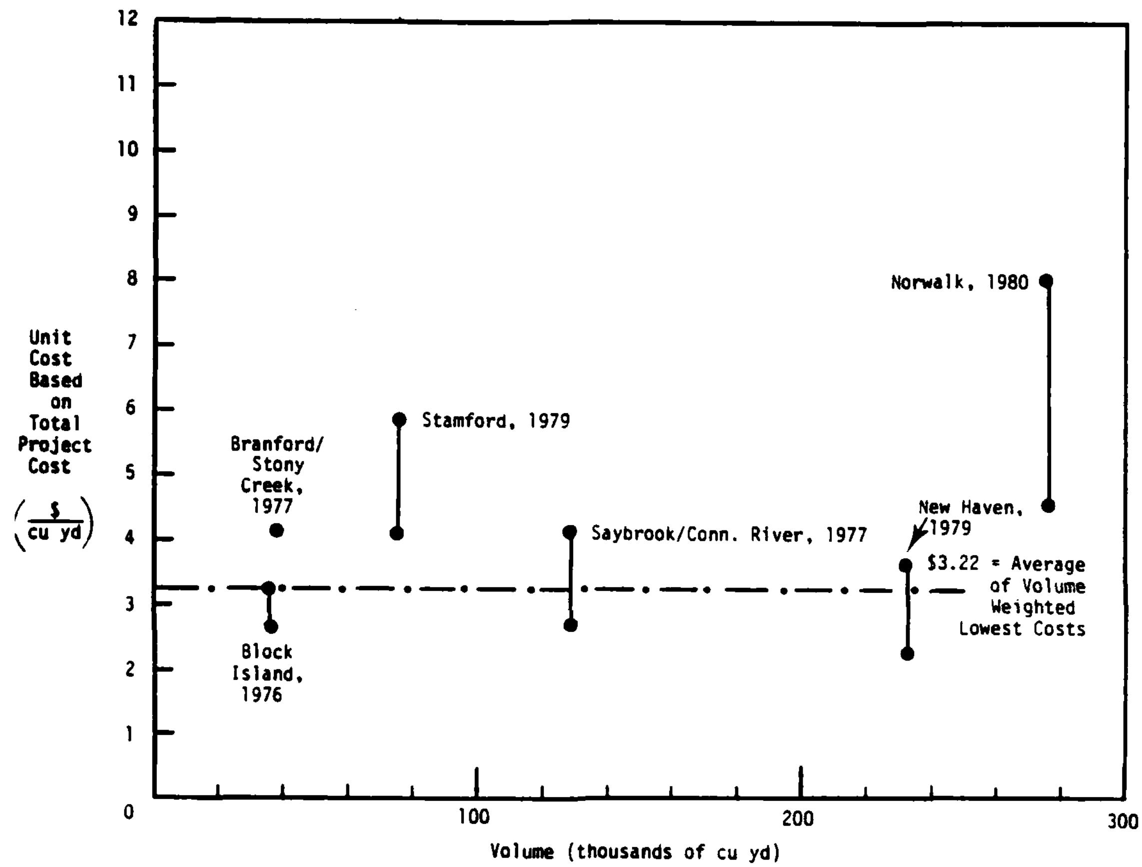

Figure 11-2. Bid costs of clamshell dredging projects in Connecticut and Block Island.

selected for a dredging project, and (b) the cost of dredging alone would amount to about 50 percent of the total cost for hydraulic dredging and about 45 percent of the total cost for clamshell dredging. We have used average volume-weighted NED/CE costs in arriving at the rounded figure of \$1.00/cu yd for hydraulic dredging and \$1.50/cu yd for clamshell dredging. While there are indications that new or improvement dredging has a lower unit cost than maintenance dredging (2), the above unit costs are considered representative of all dredging, both maintenance and improvement.

2. The construction cost of a rubble mound dike for each containment facility was computed according to the following formulas:

$$\text{Cost/mile} = (1.5H^2 + 10H)\ \$2347 + K_1HT_1 + K_2HT_2 \text{ (Exposed Dike)},$$

$$\text{Cost/mile} = (1.0H^2 + 10H)\ \$2347 + K_2HT_1 + K_2HT_2 \text{ (Sheltered Dike)},$$

where H = dike height (ft), T_1 = exposed riprap thickness (ft), T_2 = sheltered riprap thickness (ft), K_2 = \$6914, and K_1 = \$10,932 for T_1 = 1 or 2 ft; \$52,565 for T_1 = 4 ft.

The above formulas were derived by assuming the following:

(a) The crown of all dikes is 10 ft across.

(b) The slope of both sides of a sheltered dike is 1:1.

(c) The slope of the exposed side of an exposed dike is 2:1 while the slope of the sheltered side is 1:1 (3).

(d) The cost of fill material is \$12/cu yd.

(e) The cost of riprap 1 or 2 ft thick is \$25/cu yd.

(f) The cost of riprap 4 ft thick is \$120/cu yd.

The above formulas and assumptions apply in total to all facilities except the smaller containment facility in Clinton Harbor. In compiling the costs for the marsh creation, small volume (310,000 cu yd) facility only the cost of riprap for a 3:1 exposed slope (K_1 = \$15,460 with 2 ft of riprap) was used.

The above costs do not include the cost of weirs and drainage structures which, however, are assumed to be a small fraction of the costs computed from the above formulas.

3. The cost of barge transportation of dredged material , including the return trip, was computed to be \$2.70/cu yd for a distance of 10 miles and transporting material at the rate of 500,000 cu yd per year (4). The cost would be \$4.20/cu yd at a distance of 100 miles. The rates for double the annual amount of dredged material were only about 5 percent less. An alternative cost for a commonly employed tug-barge combination has been estimated at approximately 6¢/cu yd/mile (5). The

application of this rate to short distance transport of dredged material produces very low rates per cu yd. For example, the rate is \$0.60/cu yd for 10 miles. For ocean disposal 100 miles out, an average of the two rates (\$4.20/cu yd/2 + \$6.00/cu yd/2 = \$5.10/cu yd) was assumed. A linear variation between \$2.70/cu yd and \$5.10/cu yd between 10 miles and 100 miles is assumed.

Figure 11-3 is presented to clarify why the unit cost for barge transport is much higher at the 10-mile distance than at 100 miles. The data for the curves for distances of 20 miles through 100 miles are taken directly from (4). The dashed curve for the 10-mile transport distance and the dashed curve extensions for dredged material volumes less than 500,000 cu yd/yr were determined by CEM by trend extrapolation. The cost figures are national averages in 1976 dollars. The data in Figure 11-3 clearly demonstrate the much larger cost/mi/cu yd for shorter distances. For small annual volumes, the unit cost at 100 miles is about 4.5¢/mi/cu yd, while at 10 miles the unit cost is about 23.5¢/mi/cu yd Allowing some increase for inflation (15%), we obtained costs of 27¢/mi/cu yd at 10 miles and 5.1¢/mi/cu yd at 100 miles. It is CEM's judgment that a significantly greater inflating factor (i.e., 10% per year) should not be used as the unit cost at large distances (i.e., greater than 50 miles), because costs would then be much greater than the 6¢/mi/cu yd figure recently cited (5). We believe this figure is probably most accurate at a haul distance of about 50-60 miles and that a considerably higher figure should be used for short distances, and a slightly smaller figure is appropriate for longer distances.

4. The cost of transportation by temporary floating pipeline was determined from Reference 6 for a 16-inch pipeline to be about \$0.25 million per mile in 1981 dollars. This agrees well with an estimate in 1976 dollars of \$0.215 million per mile for a 16-inch pipeline with 10 effective life-years derived from data in Reference 4.

5. If it is assumed that land must be acquired for the purpose of landfill disposal, the cost of acquisition is computed at \$30,000 per acre. It may be quite reasonable to assume that land is available at no cost since after disposal and development are complete, the value of the land for sale or other use should be at least what it was initially.

6. The cost of operation of a containment facility was computed at \$50 ˉ00 per year of disposal operation. The costs of construction and operation of structures at landfill sites was computed at \$0.50/cu yd.

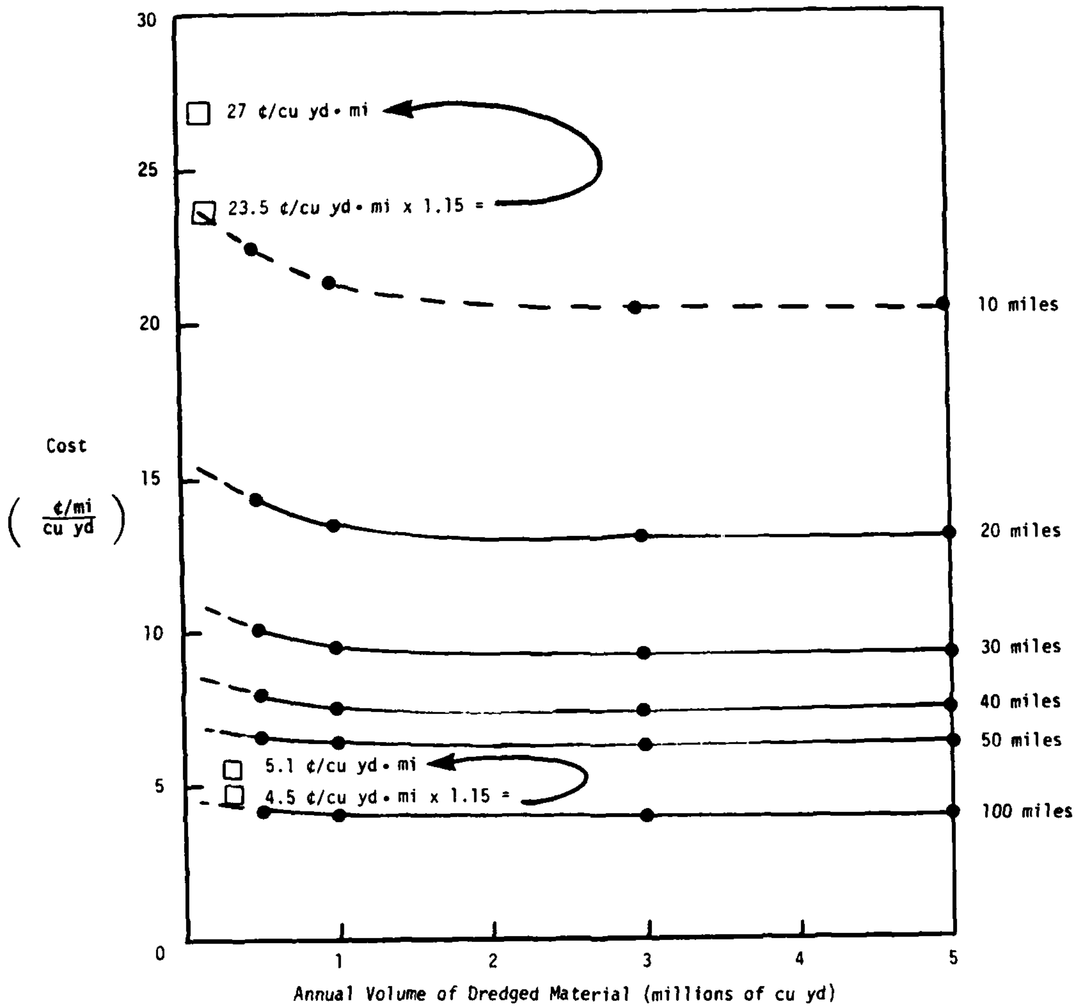

Figure 11-3. Source of transportation costs for 10 mile and 100 mile open water disposal.

Representative costs for recent dredging projects in Connecticut indicate both large variability and a general rising trend (6,7). Even during the past three years, unit costs can vary from as low as $2/cu yd or less to amounts four and five times this rate.

11.2 Alternate Disposal Methods

The major assumptions in the comparison of alternative methods of disposal are listed below.

1. The dredged material considered available for disposal from all Long Island Sound dredging sites was based on a most probable future scenario for the Long Island Sound region from 1985-2035, prepared by NED/CE (8). The average annual volumes of Federal maintenance dredging, Federal improvement dredging, and private dredging from each source as adapted are given in Table 11-1. Note that unspecified small amounts of Federal improvement dredging have been arbitrarily assigned to logical sites. The distribution of private dredge material among individual sites within a subregion is assumed to be the same as that of Federal maintenance dredging. The average annual dredging requirements for all of Long Island Sound are projected to be slightly less than 1.3 million cu yd of which 0.75 million are from Federal maintenance and improvement dredging In the containment facility scenarios, dredging material from selected Federal projects and private projects is assumed available with some exceptions, as follows: (a) Only 10 percent of material from improvement dredging is considered contaminated and likely to be deposited in a containment facility (however, in the case of Clinton Harbor all material is deposited in the local facility); and (b) no dredged material from the Connecticut River or Upper Thames River is deposited in containment facilities. This material is a likely candidate for land disposal or disposal in Long Island Sound.

2. It is assumed that the smaller containment facilities will be filled with dredged material from the dredging sites immediately adjacent to the containment facility The containment facilities at Fayerweather Island, Yellow Mill Creek, Clinton Harbor and Morris Cove would be filled using only material from the immediate area about the facilities (i.e., Bridgeport, Clinton and New Haven). The distances between the individual ports and rivers and each of the six containment facilities is given in Table 11-2. (Sources of dredged material for each containment facility are flagged by asterisks in Table 11-2.)

TABLE 11-1

MOST PROBABLE PROJECTION OF ANNUAL DREDGING REQUIREMENTS IN LONG ISLAND SOUND HARBORS AND RIVERS (1985-2035) †

Section	Location	Average Annual Volume (cu yd/yr)			
		Federal Maintenance	Federal Improvement	Private*	Total
Eastern Connecticut	Pawcatuck River	2,000	-	7,000	9,000
	Mystic River	1,000	-	3,500	4,500
	New London Harbor	10,000	32,000	35,000	77,000
	Upper Thames River	16,000	6,000**	56,000	78,000
	Niantic Harbor	2,400	-	8,400	10,800
	Region Total	31,400	38,000	109,900	179,300
Central Connecticut	Connecticut River	100,000	6,000**	87,000	193,000
	Pachoque River (+ Dutch Island Harbor)	11,000	600	9,700	21,300
	Clinton Harbor	4,200	4,600	3,600	12,400
	Guilford Harbor	6,400	-	5,700	12,100
	Stony Creek	2,100	-	1,800	3,900
	Branford Harbor	10,000	-	8,800	18,800
	New Haven Harbor	120,000	144,000	105,300	369,300
	Milford Harbor	4,000	-	3,600	7,600
	Region Total	257,700	155,200	225,500	638,400
Western Connecticut	Housatonic River	20,000	3,000**	11,400	34,400
	Bridgeport Harbor Black Rock Harbor	55,000	50,000 3,000	31,000	139,000
	Southport Harbor	3,000	-	1,700	4,700
	Westport Harbor	2,100	-	1,200	3,300
	Norwalk Harbor	21,000	3,000**	12,000	36,000
	Five Mile River	4,200	-	2,400	6,600
	Westcott Cove	1,200	-	900	1,900
	Stamford Harbor	6,000	-	3,500	9,500
	Mianus River	1,400	-	800	2,200
	Greenwich Harbor	2,000	-	1,100	3,100
	Region Total	115,900	59,000	65,800	240,700
Westchester County	Portchester Harbor	4,000	2,000**	6,300	12,300
	Mamaroneck Harbor	1,800	-	2,800	4,600
	New Rochelle Harbor	1,200	3,000	1,900	6,100
	Echo Bay Harbor	-	3,000	-	3,000
	Region Total	7,000	8,000	11,000	26,000
New York City	East Chester Creek	3,500	-	100	3,600
	West Chester Creek	19,200	3,000**	800	23,000
	Bronx River	9,800	3,000**	400	13,200
	Flushing Bay	8,800	-	400	9,200
	East River	8,000	-	300	8,300
	Region Total	49,300	6,000	2,000	57,300
Nassau County	Hempstead Harbor	2,400	3,000**	7,300	12,700
	Glen Cove Creek	1,200	-	3,700	4,900
	Region Total	3,600	3,000	11,000	17,600
Suffolk County	Huntington Harbor	240	-	4,000	4,240
	Port Jefferson Harbor	700	-	11,700	12,400
	Mattituck Harbor	5,600	3,000**	93,000	101,600
	Region Total	6,400	3,000	108,700	118,240
	TOTAL	471,440	272,220	533,900	1,277,540
	50-YEAR TOTALS (cu yd)	23,572,000	13,610,000	26,695,000	63,877,000

†The harbors used as a source of dredged material for individual DMCFs are indicated in Table 11-2.

*Private dredged material assigned in same proportion as Federal maintenance dredged material.

**"Other" improvement dredged material assigned here.

TABLE 11-2

DISTANCES BEWEEN PROTOTYPE CONTAINMENT FACILITIES
AND LONG ISLAND SOUND HARBORS AND RIVER MOUTHS

Harbor/River	Distance to Containment Site (miles)					
	Black Ledge	Twotree Island	Clinton Harbor	Morris Cove	Yellow Mill Channel	Fayerweather Island
Pawcatuck River	13.0*	17.5*	36.5	59.0	75.5	74.5
Mystic River	7.0*	11.5*	32.0	52.5	67.0	66.5
New London Harbor	1.0*	5.5*	26.0	48.5	62.0	61.5
Upper Thames River	5.0	9.0	30.0	51.5	65.0	65.0
Niantic Harbor	7.0*	2.0*	21.0	42.5	56.5	56.0
Connecticut River	14.5*	10.0*	13.0	34.5	46.5	46.0
Pachoque River	19.5*	14.5*	8.0*	30.5	44.0	43.5
Clinton Harbor	25.0*	20.5*	1.0	24.C	38.5	38.0
Guilford Harbor	32.0	27.5*	9.5	16.0	31.0	31.0
Stony Creek	37.0	32.5	15.5	10.0	30.5	30.0
Branford Harbor	42.0	36.0	19.5	7.0*	24.0	23.5
New Haven Harbor	47.5	43.5	26.0	1.5*	21.0	20.0
Milford Harbor	52.0	48.0	30.0	10.5	12.5	12.0
Housatonic River	55.0	50.0	31.5	12.0	9.0	8.5
Bridgeport Harbor	59.0	55.5	37.5	19.0	1.0*	3.0*
Black Rock Harbor	64.0	59.0	41.0	20.0	5.0	1.0*
Southport Harbor	65.0	61.0	43.0	23.5	8.5	6.0
Westport Harbor	69.0	64.5	47.0	28.5	12.5	9.5
Norwalk Harbor	67.0	71.0	49.5	30.0	14.5	12.5
Five Mile River	73.5	69.0	51.5	32.5	17.5	14.5
Westcott Cove	77.0	72.5	55.0	36.0	21.0	18.0
Stamford Harbor	79.5	75.0	57.5	38.5	23.5	20.5
Mianus River	84.0	80.0	62.5	44.5	28.5	26.5
Greenwich Harbor	83.0	79.0	61.0	42.0	27.0	24.0
Portchester Harbor	85.0	80.0	63.0	44.0	30.0	27.0
Mamaroneck Harbor	89.0	85.0	68.0	48.0	33.0	31.0
New Rochelle Harbor	93.0	89.0	71.5	53.0	37.5	35.0
Echo Bay Harbor	92.0	87.0	69.0	50.0	35.5	34.0
East Chester Creek	96.0	91.0	73.0	53.0	40.0	38.0
West Chester Creek	97.0	92.0	76.0	58.0	44.0	42.0
Bronx River	98.5	93.5	77.5	59.5	45.5	43.5
Flushing Bay	99.5	94.5	78.5	60.5	46.5	44.5
East River	102.0	96.0	80.0	62.0	47.0	46.0
Hempstead Harbor	93.0	87.0	71.0	53.0	38.0	37.0
Glen Cove Creek	91.0	85.0	69.0	51.0	36.0	35.0
Huntington Harbor	79.0	74.0	56.0	38.5	24.0	22.5
Port Jefferson Harbor	59.0	55.5	38.0	23.5	17.0	15.5
Mattituck Harbor	34.0	30.0	19.0	26.5	36.5	36.0
Greenport Harbor	21.0	17.0	12.5	30.0	38.5	38.0

*An asterisk beside a value indicates that the harbor was used in the cost analysis as a source of dredged material for the containment facility.

3. Transportation of dredged material from dredging site to containment facility is assumed to be by pipeline if the distance is two miles or less and at greater distances the material is assumed to be transported by barge. However, transportation by barge is not to exceed a distance of approximately 30 miles. Exceptions to the above include (a) Fayerweather Island containment facility were an approximate 3-mile pipeline to include all of Bridgeport Harbor for hydraulic dredging seems to be justified by the local situation; and (b) Black Ledge containment facility where all material is transported by barge after clamshell dredging even though portions of New London Harbor are within two miles of the facility.

4. In landfill disposal the acreage required to accommodate a given amount of dredged material is computed from the assumption of an average 10-ft depth of fill in the disposal area. All land disposal sites are assumed to be one mile from the dredging site. All material is therefore, transported by temporary pipeline from the dredging site to the disposal site. Therefore, the cost comparison of the containment facility with land disposal is affected by the number of dredging sites defined to be within the service area of a containment facility.

5. In the computation of costs for disposal either in Long Island Sound approximately 10 miles offshore (assumed to be 10 miles from each dredging site) or in the open ocean about 100 miles offshore, no costs were assumed beyond the cost of clamshell dredging and transportation by barge. Thus, a constant unit cost is obtained for both disposal methods that is independent of comparison with a containment facility.

Depending on the assumption made for each individual containment facility (see appropriate portions of Sections 5 through 10), the total capacity of the six proposed prototype containment facilities is in the range of 17-18 million cu yd. Over half of this amount is in the 11-million cu yd Black Ledge facility. Because of its much larger capacity, it is assumed that the containment facility at Black Ledge could have an operational lifetime of up to 97 years. All other facilities are assumed to have much shorter operational lifetimes. These include 30 years for the Twotree Island facility; 25 years for the smaller facility in Clinton Harbor; 15 years or less for the Fayerweather Island facility; and 5 years or less for the facilities at Yellow Mill Channel and Morris Cove. More rapid rates of fill or use of the facilities for more of the improvement dredged material would shorten these periods.

11.3 Example of Cost Calculations

This section contains a detailed step-by-step listing of the cost computations for Clinton Harbor. It is intended as an example, as it was not deemed necessary to present this detail for each prototpye containment facility. Clinton Harbor was selected as the example because the calculations include two scenarios containing different sized containment facilities. In the calculations given below, Scenario #1 will refer to the larger containment facility of 700,000 cu yd capacity which receives dredged material from Clinton Harbor alone. Scenario #2 refers to the smaller containment structure of 310,000 cu yd capacity which also receives dredged material only from Clinton Harbor and thus also only includes hydraulic dredging

CONTAINMENT FACILITY

COST OF DREDGING

Scenario #1

Source	Distance (mile)	Dredged Material cu yd	Time Period
Clinton Harbor	1	700,000	56 years

The above is based on average annual projections of 12,400 cu yd at Clinton Harbor for Federal improvement and maintenance dredging and private dredging.

Cost for Hydraulic Dredging

$1.00/cu yd x 700,000 cu yd = $700,000

Scenario #2

Source	Distance (mile)	Dredged Material cu yd	Time Period
Clinton Harbor	1	310,000	25 years

Cost for Hydraulic Dredging

$1.00/cu yd x 310,000 cu yd = $310,000

Cost of Transportation
Scenarios #1 and #2

Cost for Transportation by Pipeline

$250,000/mile x 1 mile = $250,000

Cost of Containment Facility Construction

Scenario #1

Dike Length	=	5600 ft	Exposed Surface Slope = 1:2
Dike Height	=	20 ft	Exposed Surface Riprap Thickness = 2 feet

Cost/mile = $(1.5\,H^2 + 10H)\ \$2347 + K_1HT_1 + K_2HT_2$

= $(1.5\,(20)^2 + 10\,(20))\ \$2347 + \$10{,}932\ (20)2 + \$6914\ (20)1$

= $1.878 mil + $0.437 mil + $0.138 mil

Cost = $1.993 mil + 0.464 mil + $0.146 mil

Cost = $2,603,000

Scenario #2

Dike Length	=	4400 ft	Exposed Surface Slope = 1:3
Dike Height	=	11 ft	Exposed Surface Riprap Thickness = 2 feet

Riprap Cost/Mile = H x T x $15,460

= (11) x 2 x $15,460 = $0 340 mil

Cost = $0.340 mil x 4400/5280 = $283,000

Cost of Containment Facility Disposal Operation

Scenario #1

Disposal Operation Cost = $50,000/yr x 14 yr of operation = $700,000

Scenario #2

Disposal Operation Cost = \$50,000 x 6 year of operation = \$300,000

Total Cost and Unit Cost

Scenario #1

Total Cost = Dredging Cost + Transportation Cost + Construction Cost + Disposal Cost

Total Cost = \$700,000 + \$250,000 + \$2,603,000 + \$700,000 = \$4,253,000

Unit Cost = Total Cost/Volume of Dredged Material

Unit Cost = \$4,253,000/\$700,000 = \$6.08/cu yd

Scenario #2

Total Cost = \$310,000 + \$250,000 + \$283,000 + \$300,000 = \$1,143,000

Unit Cost = \$1,143,000/\$310,000 = \$3.69/cu yd

LAND DISPOSAL

Acreage Required and Cost (Optional)

Scenario #1

Volume to fill = 700,000 cu yd

Assume Average Depth of 10 feet

Cubic ft Required = 700,000 x 27 = 18,900,000 ft^3

Area Required = 18,900,000 ft^3/10 ft = 1,890,000 ft^2

Area = 1,890,000/43,560 = 43 acres

Acquisition cost = 43 acres x \$30,000/acre = \$1,290,000 (optional)

Scenario #2

Volume = 310,000 cu yd x 27 = 8,370,000 ft^3

Area = 8,370,000 ft^3/10 ft = 837,000 ft^2/43 '60 = 19 acres

Acquisition cost = 19 acres x \$30,000/acre = \$570,000 (optional)

Dredging, Transportation and Disposal

Scenario #1

Hydraulic Dredging Cost	=	700,000 cu yd x $1.00/cu yd = $700,000
Pipeline Transportation	=	$0.250 mil/mile x 1 mile x 1 site = $250,000
Disposal Operation	=	700,000 cu yd x $0.50/cu yd = $350,000

Scenario #2

Hydraulic Dredging Cost	=	310,000 cu yd x $1.00/cu yd = $310,000
Pipeline Transportation	=	$0.250 mil/mile x 1 mile x 1 site = $250,000
Disposal Operation	=	310,000 cu yd x $0.50/cu yd = $155,000

Total Cost and Unit Cost

Scenario #1

For No-Cost Land Acquisition:

Total Cost = Dredging Cost + Transportation Cost + Disposal Cost

Total Cost = $700,000 + $250,000 + $350,000 = $1,300,000

Unit Cost = $1,300,000/700,000 cu yd = $1.86/cu yd

For Land Use Purchase:

Total Cost = $1,300,000 + Cost of Land = $1,300,000 + $1,290,000 = $2,590,000

Unit Cost = $2,590,000/700,000 cu yd = $3.70/cu yd

Scenario #2

For No-Cost Land Acquisition:

Total Cost = $310,000 + $250,000 + $155,000 = $715,000

Unit Cost = $715,000/310,000 cu yd = $2.31/cu yd

For Land Use Purchase:

Total Cost = $715,000 + 570,000 = $1,285,000

Unit Cost = $1,285,000/310,000 cu yd = $4.15/cu yd

LONG ISLAND SOUND DISPOSAL

Scenario #1

Cost of Clamshell Dredging = 700,000 cu yd x $1.50/cu yd	=	$1,050,000
Cost of Barge Transportation = 700,000 cu yd x $2.70/ cu yd	=	$1,890,000
Total Cost = $1,050,000 + $1,890,000	=	$2,940,000
Unit Cost = $2,940,000/700,000 cu yd	=	$4.20/cu yd

Scenario #2

Cost of Clamshell Dredging = 310,000 cu yd x $1.50/cu yd	=	$465,000
Cost of Barge Transportation = 310,000 cu yd x $2.70/cu yd	=	$837,000
Total Cost = $465,000 + $837,000	=	$1,302,000
Unit Cost = $1,302,000/310,000 cu yd	=	$4.20/cu yd

OCEAN DISPOSAL

Scenario #1

Cost of Clamshell Dredging = 700,000 cu yd x $1.50/cu yd	=	$1,050,000
Cost of Barge Transportation = 700,000 cu yd x $5.10/cu yd	=	$3,570,000
Total Cost = $1,050,000 + $3,570,000	=	$4,620,000
Unit Cost = $4,620,000/700,000 cu yd	=	$6.60/cu yd

Scenario #2

Cost of Clamshell Dredging = 310,000 cu yd x $1.50/cu yd	=	$465,000
Cost of Barge Transportation = 310,000 cu yd x $5.10/cu yd	=	$1,581,000
Total Cost = $465,000 + $1,581,000	=	$2,046,000
Unit Cost = $2,046,000/310,000 cu yd	=	$6.60/cu yd

11.4 References for Section 11

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5. Dames and Moore, "Environmental Impact Report, Open Water Disposal of Dredged Material in Long Island Sound, Block Island Sound, and Adjacent Waters," July 1980, prepared for the Army Corps of Engineers, New England Division.

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7. Personal Communication with Lawrence Hoch, Fournier Towboat Corporation Boston, MA, September 4, 1981

8. Department of the Army, Corps of Engineers, New England Division, "Economic Analyses of Future Dredged Material Disposal in Long Island Sound," Appendix C of Draft Programmatic Environmental Impact Statement for the Disposal of Dredged Material in the Long Island Sound Region, 1981, Waltham, MA

APPENDIX A

Literature Review And Bibliography

A.0 IMPACT ASSESSMENT METHODOLOGY

A.1 Background for Impact Assessment

The National Environmental Policy Act (N.E.P.A.) of 1969 (Public Law 91-90) established a broad national policy directing Federal agencies to maintain and preserve environmental quality. Section 102(2) (c) of the N.E.P.A. established requirements for environmental impact statements and required all Federal agencies and officials to:

- o Direct their policies plans and programs to protect and enhance environmental quality.
- o View their actions in a manner that will encourage productive and enjoyable harmony between man and his environment.
- o Promote efforts that will minimize or eliminate adverse effects to the environment and stimulate the health and well-being of man.
- o Promote the understanding of ecological systems and natural resources important to the Nation.
- o Use a systematic and interdisciplinary approach that integrates the ecological, social, cultural, and economic factors in planning and decision-making.
- o Study, develop, and describe alternative actions that will avoid or minimize adverse impacts.
- o Evaluate the short- and long-term impacts of proposed actions.

Subsequent legislation (e.g., Section 122 of the River and Harbor and Flood Control Act of 1970--P.L. 91-611) and the promulgation of the "Principles and Standards for Planning Water and Related Land Resources" by the U.S. Water Resources Council (1973) further established the policy framework for planning activities and provided operational criteria for achieving uniformity and consistency in comparing, measuring and judging beneficial and adverse effects of alternative actions.

The Corps developed the Engineer Regulation (ER) 1105-2-200 series to establish internal guidance for conducting feasibility studies for water and related land resources. The general planning process as outlined in ER 1105-2-200 is illustrated in Figure A-1 and consists of three planning stages:

- o Stage 1: Development of Plan of Study
- o Stage 2: Intermediate Plans
- o Stage 3: Detailed Plans

With each stage, four functional planning tasks are to be addressed, including:

- o Problem Identification
- o Formulation of Alternatives
- o Impact Assessment
- o Evaluation

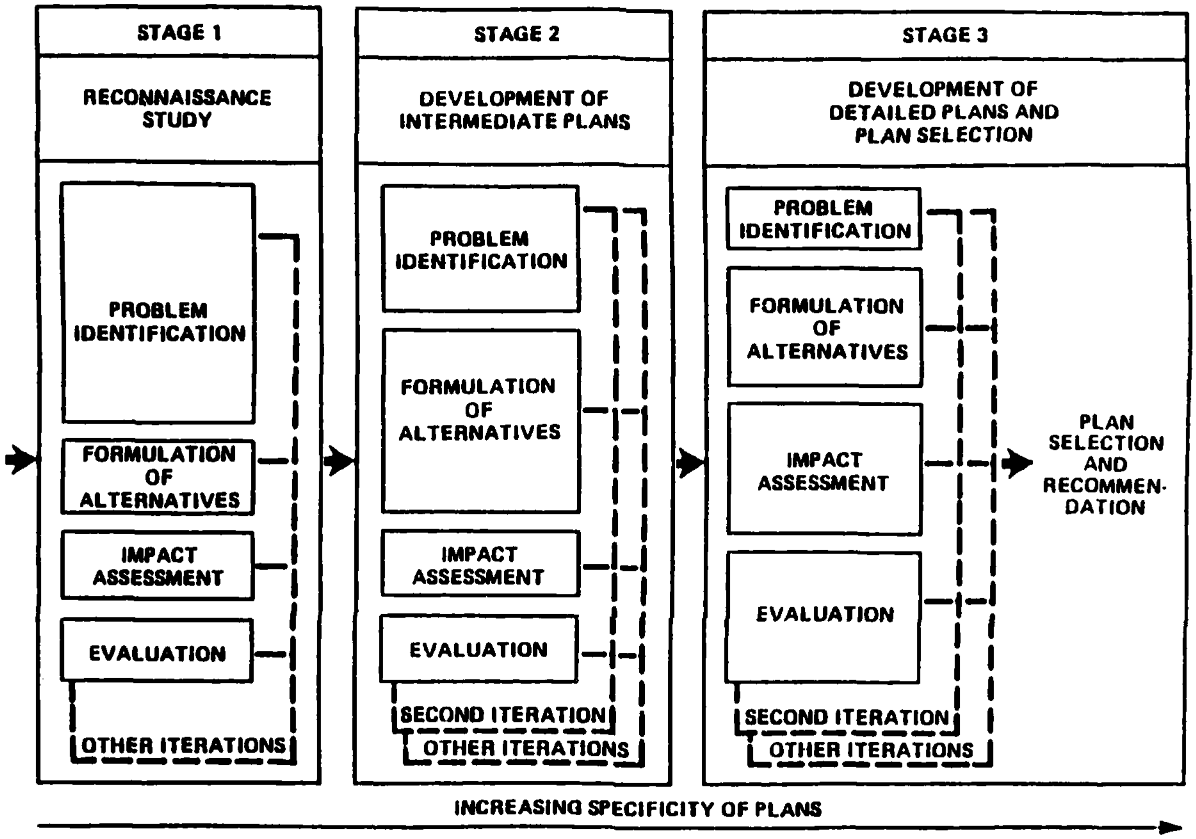

Figure A-1. General relationship of plan development stages and functional planning tasks.

The four planning tasks are undertaken during each stage; however, the emphasis on each task varies. It is noteworthy that the planning process is iterative in nature, which is an aid in proceeding toward resolution during subsequent planning stages of initially identified issues.

A.2 Impact Assessment Methodology

As noted in the Introduction, the present study is taking place as a "Stage 2--Intermediate Plans" activity. As such, there is a need for development and application of an impact assessment methodology appropriate for identifying evaluating and communicating relevant information into the overall planning process. Several objectives which an impact assessment methodology should address include the following:

- o The methodology should be systematic but flexible so that application of knowledge and professional judgment in a comprehensive manner is enhanced.
- o The methodology should provide a means of identifying data needs and determining priorities for allocating resources.
- o The methodology should also provide a framework for evaluating alternative plans on a comparable basis.
- o The methodology should be useful in evaluating the effectiveness of mitigation measures and formulating additional measures.

Many methods of impact assessment have been developed and applied to specific types of projects and planning processes. These methods include checklists, matrices, overlay or network methods and ad hoc procedures. In general, a most important first step is to systematically identify attributes or variables relevant to particular categories of projects and potential impacts typically associated with proposed project activities. Although a variety of ranking and scaling approaches can be used to summarize impact assessments for presentation (27, 28, 29, 30), the essential aspects of any approach lie in exposition of the impact attributes vis-a-vis project characteristics. Additionally, integration of the assessment approach into an interactive planning process which permits feedback and (possible) modification of project concepts and/or design to mitigate potential adverse impacts should be sought

As with the overall DMCF planning process, the impact assessment procedure was conducted in an iterative manner as illustrated in Figure A-2. Preliminary scenarios were developed detailing relevant aspects of the potential DMCF which could be considered causative factors for potential social impacts. Preliminary location maps were prepared for each facility. In addition, an overview description was developed of the DMCF site vis-a-vis characteristics of adjacent land uses (e.g., zoning) and trends, and special features (e g cultural resources). This description

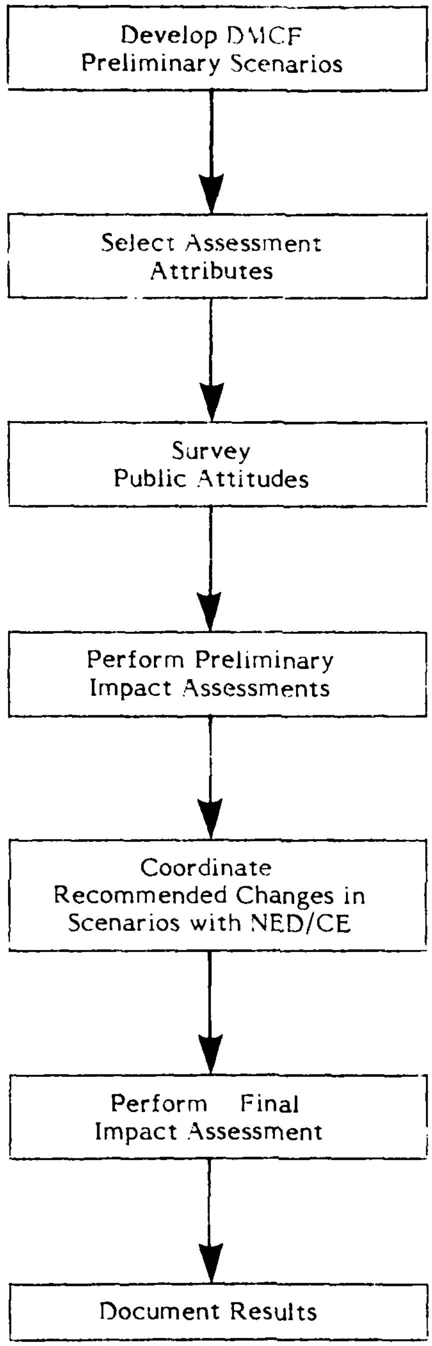

Figure A-2. Impact assessment procedure involves iterative application of steps for DMCF development.

provides an initial base-level description of existing conditions and provides backdrops against which projected conditions can be detailed given development of the DMCF. The DMCF refined scenarios are presented in Section 5 through 10 of this report.

A list of social impact assessment attributes was developed appropriate for gauging the extent of departure from existing base-level conditions assignable to the potential DMCF. Section 3.3 below presents summary discussion and rationales for selection of social and economic impact attributes as developed from literature review, review of NED/CE permit applications, communication with Corps personnel and other persons knowledgeable of DMCF's, and the writer's professional judgements and experience. For background information, data on 193 general permits issued by NED/CE for projects in Connecticut in 1979 and 1980 were analyzed to determine the sources and nature of objections to recent dredging and non-dredging permit applications from Connecticut and what steps were taken by applicants to ameliorate objections. Additional information on impact attributes was developed through communications with individuals in the DMCF communities.

Evaluation of social and economic impacts for each DMCF was accomplished through identification of causative factors and tracing of potential effects per the impact attributes list developed previously. Documentation of impact assessments is presented in Sections 5 through 10 of this report. As part of the evaluation process, investigators sought assessment feedback from other sources--particularly community opinion leaders familiar with community preferences and needs. Other contacts were made with individuals with specialized knowledge of the DMCF area characteristics such as cultural, historical and archeological resources. Consultation with a spectrum of interests served several purposes including: (1) review of the completeness or adequacy of the impact attributes and assessment rationales; (2) review of preliminary assessments made by the investigative team to validate designation as significant or not significant, beneficial or adverse; and (3) to solicit suggestions on possible mitigation measures to minimize adverse impacts.

Interview forms summarizing these contacts are presented in Appendix B. The preliminary results of the interviews were summarized and a subjective summary of short- and long-term primary (within one mile radius of the facility) and secondary (within one to five miles radius impacts) were prepared. More detailed scenarios were developed, describing the possible sequence and magnitude of events that might be involved in constructing and filling each facility.

As applied, the assessment methodology was dynamic in that new information was incorporated into the DMCF refined scenarios and assessment documentation. This was particularly so for mitigation measures, as NED/CE planners evidenced a willingness to modify preliminary DMCF characteristics to minimize potential social impacts. More detailed scenarios were developed, taking into account many of the comments derived from public attitude survey and workshop responses. In this sense, results obtained and documented herein should be viewed as a "snapshot" of DMCF planning at one point in time. Integration of this report into the on-going DMCF planning process will likely result in further refinements and modifications.

A.3 Social and Economic Impact Assessment Attributes

No single "best" list of important assessment attributes can be developed that would be applicable to all water resources projects or even DMCF's. An overall structure for categorization of assessment attributes is suggested in the Principles and Standards in which significant impacts of a proposed action are assessed and results displayed in terms of contributions to four accounts: National Economic Development (NED), Environmental Quality (EQ), Social Well-Being (SWB), and Regional Development (RD). This study is primarily directed to SWB and RD accounts which have subsequently been renamed by the WRC and Corps of Engineers as the Other Social Effects (OSE) and Regional Economic Development (RED) accounts (ER-1105-2-240). The concept of accounts and categories for grouping of assessment attributes has been used by many investigators including the Corps' Water Resources Assessment Methodology (22) and the SELECS Methodology (28, 29, 30). The reports of the Dredged Material Research Program were a most informative source (4,5,6,7,8,9,10,11,12,13, 14,15,16,17,19,20,21,25,31). These and other references provided an initial basis for development and exposition of select assessment categories and associated attributes which in total can be displayed as the Other Social Effects and Economic Effects accounts as part of a larger accounting procedure.

Before detailing the assessment categories and accounts, a distinction needs to be made between the temporal and spatial scope for which the impact assessments are to be made. The temporal distinction is short-term and long-term impacts. Short-term impacts apply to DMCF activities during the construction and filling period and long-term impacts relate to the potential eventual DMCF site use projected to be established. Spatial distinction is obtained by definition of primary and secondary social and economic impact areas for each DMCF. The primary impact areas are

defined as those geographic areas at which existing economic and social conditions will be directly effected, either favorably or unfavorably. Conditions directly effected may include aesthetic appeal, land use changes, land values, recreational opportunities, and employment opportunities in the immediate locale For purposes of this study, the primary impact area is taken to be the area within a one-mile radius of the DMCF. Indirect impacts within the secondary impact areas would have regional implications and may include income distribution, commercial and industrial activity regional employment, transportation and quality of life changes within the Long Island Sound (LIS) region. Note that assessments are to be made for individual DMCF development and operation (i.e., disposal) and not for each and every dredging project generating material to be disposed of (i.e., the impacts of dredging and channel deepening for the entire LIS region are not addressed).

Table A-1 lists and summarizes five categories of impacts involving 23 attributes selected for use in this study. Discussion of the rationales for each attribute vis-a-vis DMCF characteristics and review of available literature is presented next

A.3.1 Category I: Life, Health and Safety

A.3.1.1 Boating Hazards

Boating hazards attributable to development and operation of a DMCF can arise in several ways. During construction, barges and other support vessels and/or floating pipelines can block off or congest navigation ways normally used by recreational and other commercial vessels, thereby increasing the risk of boating accidents. A DMCF located in an area with a high level of boating activity would be considered to have a higher potential for boating hazards. Scheduling of dredging and disposal activities during off-peak recreational boating seasons (e.g., early Spring, late Autumn) can minimize potential adverse impacts on recreational boaters.

On the other hand development of a DMCF on shallow rocky shoal areas which are currently considered a boating hazard can contribute to reducing the hazard. That is, a readily identifiable land entity will aid boaters in steering away from foul ground formerly difficult to identify.

A.3.1.2 Construction Hazards

Development of a DMCF requires a number of construction related activities including truck and other heavy equipment movements and placements of diking material, grading and contouring of dikes. The potential for injuries to workers is little different from any other land-based construction- related projects although some distinction for a DMCF could be made based on proximity to water and the potential

for working in varying sea conditions. For this reason hazards to construction workers on DMCF island sites are considered somewhat higher than for land-linked DMCF sites. Construction hazards to other non-project persons who are merely curious or bent on vandalism is considered higher for those sites in higher populated areas with easy land access. In these situations, more stringent control of off-site access must be established during the DMCF construction period

TABLE A-1

DEFINITIONS OF 22 IMPACT ATTRIBUTES

Category 1: LIFE, HEALTH, SAFETY

1. Boating Hazards: Those created by barges and support vessels during construction; and those due to containment areas.
2. Construction Hazards: Injuries to workers or to (illegal) visitors during dike building or during placing and grading dredged materials.
3. Final Use Hazards: Creating new land also creates a potential for more accidents as more people visit the site.
4. Traffic Congestion: The number of additional vehicles used during construction and final use is added to the number already present in the primary impact area.
5. Vectors (organisms which can carry and transmit disease): Norway rats and mosquitos are of concern.
6. Air Pollution: Particulate matter--especially dust from movement of dredged material that has been partially dewatered--is the principal pollutant to measure. Exhaust gases from various machines are also considered.

Category 2: COMMUNITY ORGANIZATION

7. Displacement of People: Need for road access during site construction may force relocation. Fishermen, and other commercial, industrial and recreational interests may suffer.
8. Zoning Compatibility: Final use of the site must agree with zoning regulations of the adjacent region. Potential for zoning waivers are considered.
9. Accessibility: Both physical (road access, elevated structures) and psychological (attractiveness of site) are considered.
10. Community Service: Increases in need and use of service personnel such as police, fire and maintenance persons.
11. Perceived Need for a Particular Final Use: What community persons feel and say about what their community needs or lacks the most.

Category 3: FINANCIAL

12. Land Value: Price of property surrounding or near a containment area may be affected; this will be considered.
13. Employment: The number of new jobs created by construction or by final use will be compared to those who are unemployed and are looking for jobs.

Category 4: EDUCATIONAL, CULTURAL, RECREATIONAL

14. Recreational Opportunities: Community population in relation to per capita recreational opportunity will be considered.
15. Educational Opportunities: Community size, number of projected visitors to the site, size of the site and "general educational enthusiasm" will be considered.
16. Proximity of a Cultural Resource: Are there theaters, museums, aquariums, universities or other landmarks close to the site?
17. Historical Significance: Sites in or similar to those in the *National Register of Historic Places* will be identified.

Category 5: AESTHETICS

18. Noise: Machinery used during construction and operation may add, temporarily, to noise level near the site.
19. Odors: Dredged material may contain sediments with organic composition that create odors dispersed by wind. The number of people in the primary impact area is of concern.
20. Exposure: This involves the number of people in in a community who might view and be visually affected by the containment area.
21. Compatibility: How does the proposed site fit in with what is around it? (This goes beyond the question of legal zoning requirements.)
22. Reduction in Panoramic View: Both the dike and the necessary operation equipment may interfere with the opportunities offered by shorelines for wide, unobstructed views.

Containment area stability is amenable to engineering control and is only an issue to the extent that affected residents perceive it to be a hazard. This can be overcome by, first, good engineering practice and, second, effective communication

A.3.1.3 Final Use Hazards

The nature of anticipated final uses of DMCF created land can be related to differences in hazards to persons using the land. Final use hazards apply over the long-term and not during short-term facility development operations For example, use of the created land for heavy industrial purposes in a highly populated area would be expected to have a higher potential for accidents to workers and visitors then would land use for passive recreational purposes. Such accidents as might potentially occur may be related to increased vehicular traffic material handling operations and other activities. Public concern has been expressed regarding DMCFs becoming an "attractive hazard." Harrison and Chisolm (107) report that the use of one disposal site as a play area by children necessitated a 24-hour Corps patrol to prevent trespassing.

A.3.1.4 Traffic Congestion

Development and continued use of DMCF created land can cause increased traffic on area roads (31). If dike construction, for example, is accomplished by land haul using trucks, movement of the trucks through neighborhoods surrounding the disposal site could be viewed as an adverse impact. Even with offshore island DMCF's, hauling of dike material from inland borrow sites to barge loading points for transport to the DMCF would be required. Truck traffic increases are estimated as a function of dike volume and related to potential changes in traffic in areas adjacent to the DMCF. Final use activities on DMCF lands may also be related to increased traffic associated with travel to and from the site. Traffic generation associated with proposed land uses and the goods movement capabilities of available roadway networks were influential elements in 11 out of 12 DMCF case studies (7,8).

A.3.1.5 Containments and Vectors

Vectors are organisms which can carry and transmit disease. For the Long Island Sound region vectors of concern include Norway rats, mosquitos and other flying insects. Dredged material containment facilities have been linked with increased numbers of mosquitos in a report by a North Carolina State University entomologist (106). The mosquito problem was also identified as a potential concern by the Dredged Material Research Program (31). The problem is related to ponding of water during dewatering of disposed sediments which creates an environment conducive to mosquito

breeding. In warm weather, the control of mosquitos at dredged material disposal sites has been addressed by Ezell (108), who concluded that mosquitos can be controlled by a variety of methods. Physical control measures which permit drainage and/or flushing actions are the most effective.

A.3.1.6 Air Pollution

Dewatered dredged material when dried is potentially available for transport off-site by wind action (31,107). Dust and dirt carried by wind can adversely affect air quality in areas adjacent to the DMCF. The problem is believed not as severe in the Northeast as it is in the Gulf Coast area. Some air quality degradation may be attributable to exhausts from heavy machinery and trucks during DMCF construction and operation (31).

Severity of potential air pollution activities is related to the size of the site (i.e., probable exposed and dried sediments) and distance to inhabited areas near the DMCF. Mitigation measures to avoid off-site transport of dust particles include maintenance of a wetted surface capping with coarse material and establishment of vegetative cover.

A.3.2 Category 2: Community Organization

A.3.2.1 Displacement of People and Activities

A dredged material containment area can displace people in two different ways. Local residents may lose their homes to road construction if such is necessary for either short-or long-term purposes (i.e during road construction, or for final usage). As noted by SCS Engineers (31), for federally funded projects, acquisition of land and relocations of residents must be conducted in accordance with the Uniform Relocation Assistance and Real Property Act of 1970. Generally, relocations should be minimized and careful assessment made of advantages of a proposed site which justifies inconvenience to local residents. In addition, the presence of shellfish, lobsters, or any other commercially-utilized marine species that are not highly mobile at the site of the dredged material containment area could lead to a loss of revenue and employment when the facility is constructed.

A.3.2.2 Zoning Compatibility

Zoning classifications of land ajacent and near to proposed DMCF's are a reflection of community desires for uses of those lands (6). A proposed DMCF with ultimate land use which is not compatible with adjacent land use zone classifications can result in public opposition (31). Compatibility of proposed land use with adjacent

uses was identified as a major issue at six of twelve DMCF's according to a recent survey (7,8). In one instance, a proposed 128-acre Crystal Beach confined disposal site near Tampa, Florida, which failed to make site land use plans public, fueled speculation that a use inconsistent with the character of their community was planned. Related issues are: (1) whether ultimate land use would be public or private, and (2) whether the proposed land use should be water-dependent. The conclusion was drawn that in areas of limited waterfront land markets, it makes sense to fully utilize available water access.

A.3.2.3 Accessiblity

Accessibility pertains to several related aspects of community involvement in a developed DMCF (long-term usage). Adequate road access is only one factor to consider and may be considered a beneficial or adverse factor depending on expressed community objectives. For example, if high density usage is envisioned (e g., housing) then good road access is a plus. Conversely, little or no road access is desirable if wildlife habitat is the DMCF development goal. Other factors can be considered with this attribute, such as separation by open water or rivers, limited access highways, railroad tracks, or other physical barriers.

A.3.2.4 Community Services

Community services involve publicly funded activities and the support staff required to maintain community-decided standards. The primary departments involved in service to the community are the police, firemen, educators and health services This attribute applies primarily to long-term conditions, although some local services assistance may be required during construction phases (e.g., relocation of utilities). While privately-funded services would also be expected to increase with intensive development of a DMCF, major concerns identified in previous DMCF projects relate to local governmental commitment to DMCF maintenance and security (7,8). Resolution of the community services issue requires legal-institutional arrangements which detail DMCF property ownership and operation/maintenance/security responsibilities

A.3.2.5 Perceived Need

The nature of planned final use of DMCF created land can contribute to expressed community needs (6,7,31). Particularly in Connecticut, the Coastal Area Management Act specifies that land uses which require water frontage are to be given priority over those which do not. Proposed land uses to be located on a DMCF with water frontage or with access to shipping channels, should capitalize on these special

advantages. A community without adequate public waterfront access, for example, could assign a high priority to a park as final use. General concurrence within the local community with the land use plan for the DMCF lends substantial additional support for the overall project, even when fairly strong environmental issues exist (7,8).

A.3.3 Category 3: Financial

A.3.3.1 Land Value

Development of a DMCF and commitment to a final use may have positive or negative influences on the market value of surrounding land parcels (5,6,7,8,19). In some cases, the influence on adjacent land values is related to the disparity of uses For example, a commercial development on a DMCF may adversely impact adjacent residential housing land values but adjacent commerical land values may increase due to spin-off growth (7,8).

A.3.3.2 Employment

As noted previously, overall community reaction to a proposed DMCF project is often strongly influenced by the project's contribution to community needs. Job-producing planned uses in areas of depressed employment are likely to be favored (7). Employment increases during DMCF construction phases may be significant but, as with other construction projects, workers may come long distances, not just from the local area.

A.3.4 Category 4: Educational, Cultural, Recreational

A.3.4.1 Recreational Opportunities

Interruptions of recreational opportunities during construction and material placement operations are temporary impacts but can be significant. Loss of boat mooring space, restrictions on access to beaches and wildlife viewing areas, and limitations on boating areas are possible due to floating pipeline placements, barge movements and DMCF security measures. In many areas along the Connecticut coast, recreational space is inadequate DMCF created land can alleviate part of this deficiency either by expanding existing facilities or by creating new recreation areas where none were before. Parks, camp grounds, marinas, bird and wildlife sanctuaries, and fishing and swimming areas are among the diverse possible recreational uses of DMCF lands along the Connecticut shore

A.3.4.2 Educational Opportunities

A community-oriented educational/recreational facility can be viewed as an asset to the area near the site, to people who live in the community, and to potential tourists. This attribute is similar to the Perceived Need attribute (Section A.3.2.5) but is focused on here due to its expressed importance. For example, both the Twotree Island and Black Ledge DMCF sites were originally suggested by community environmental education groups.

A.3.4.3 Proximity of Cultural Resources

Are there valued cultural resources--theaters, museums, aquariums, universities--in the vicinity of the proposed DMCF area? This attribute was one of several used for preliminary DMCF site selection evaluations for Long Island Sound (54,84). Assessment is made based on judgement as to whether the proposed DMCF use would add to or detract from these resources in any way.

A.3.4.4 Historical Significance

Proposed DMCF construction and/or final land use may interfere with an existing historic site--either by threatening its continued existence or by being inappropriate in use or design Historic sites are identified in the 1976 National Register of Historic Places and state and local community historians. Historical artifacts are pesently recognized by the Corps of Engineers in its Special Conditions for Permits:

> "If during any earth moving activity or ground disturbance, by hand or machinery, archeological, scientific, pre-historical, or historical remains are encountered, the work will stop immediately."

A.3.5 Aesthetics

A.3.5.1 Noise

Noise levels greater than existing levels may occur during DMCF construction, due to trucks, dredge pumps and other machinery. Noise impacts from a steady pumping operation were reported 2000 feet away from the source (107). Final uses of DMCF lands may have additional noise generating activities over the long term. Assessment of noise impact is guided by: (1) the probable differences in noise levels with and without the DMCF; and (2) distance to potentially impacted persons.

A.3.5.2 Odors

Exposure to the air of organic-rich dredged material can result in production of offensive odors during and temporarily after material placement. While Harrison and Chisolm (107) report that objectionable odors have been reported in the vicinity of several confined disposal areas, Harrison et al. (109) report that most odor problems are due to the liberation of gases during pumping operations. These gases can be

controlled but are primarily short-term phenomena. Gushue, et al (~) note that although concerns about odors are often expressed, seldom do such short-term sensory factors dictate the ultimate acceptability of a DMCF. Assessment of potential severity of DMCF odors is based on several factors, including: (1) sediment character, (2) DMCF design characteristics (e.g., new marsh) and operations schedule (e.g., one-shot or periodic disposal), and (3) proximity to populated areas.

A.3.5.3 Visual Exposure

Visual exposure refers to the number of people who live and work within line-of-sight of the dredged material containment area, or who would reasonably be expected to enter this primary impact area. The greater number of individuals present, the more significant the impact Whether the impact is beneficial or adverse depends somewhat on mitigations during construction, but varies widely with the final use of the area. Mann, et al. (25) have reviewed constraints and potentials for landscape development of DMCF's, and it would seem that under most circumstances visual acceptance can be greatly enhanced by well-conceived contouring and plantings.

A.3.5.4 Visual Compatibility

The use of the land adjacent to the dredged material containment area is the primary consideration for determining visual compatibility. Even if zoning requirements are met, the proposed use may disrupt the area's character by being inappropriate in a social-economic sense (such as low-rent housing adjacent to private beach clubs); inappropriate with regard to intentions (such as an industry in a residential area, or a marsh near certain types of industrial establishments); or structurally incongruent (such as a new building near older, historic sites, or very tall structures near very short ones), Determination of the degree of incompatibility is quite site-specific, and the variables contributing to the attribute require value judgements, but this does not lessen the importance in any way

A.3.5.5 Reduction in Panoramic View

An aesthetically desirable sight, particularly along a shoreline, is a wide panoramic view unobstructed by large buildings (People and the Sound, Shoreline Appearance and Design). In New England, the relatively flat Connecticut shoreline offers excellent opportunities for panoramic viewing. A panoramic view can be degraded by narrow, tall anomalies, or by wide, low structures--or any combination of the two. Thoughtful design of DMCF's should h to make the reduction in panoramic view as little as possible. Natural topographic contours, minimization of long straight dike lines, lowering high dikes by exended inland sloping, and plantings can help to mitigate the apparent effects of reduction in panoramic view.

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APPENDIX B

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Mr. Elston, Head, Vector Division
Connecticut DEP
Madison, CT (203) 245-2198

Mr. Miller, Connecticut Parks Dept.
Hartford, CT (203) [illegible]6-2304

TWOTREE ISLAND

Personal Interviews

Clint Brown, Town Planner
Town of Waterford
Town Hall, 200 Boston Post Road
Waterford, CT 06385 (203) 442-4489

Lawrence Dettencourt
First Selectman, Town of Waterford
200 Boston Post Road
Waterford, CT 06385 (203) 442-4489

Mr. Dimmock, Assessor
Town of Waterford
200 Boston Post Road
Waterford, CT 06385 (203) 442-4489

Telephone Contacts

Frank Bohlen, Marine Resource Hydrologist
University of Connecticut at Avery Point
Groton, CT (203) 446-1020,x.256

Mrs. Lambert
Northeast Utilities Energy Center
New London, CT (203) 447-1791

Steve Toth
Millstone Nuclear Power Plants
Waterford, CT (203) 442-0751

Bob Porter, Shellfish Commission
Town of Niantic (203) 739-5875

Frank Utaro
Seaside Regional Center
Waterford, CT (203) 447-0301

Personal Interview	YELLOW MILL CHANNEL/BRIDGEPORT HARBOR CEM

Contact: Reginald Walker, Assistant Town Planner City of Bridgeport City Hall 45 Lyon Terrace Bridgeport, CT 06604	**Telephone:** 203-576-7603

A park extension is a great idea. Children have drowned in the area, and the water at the site is polluted.* Very few boaters use the channel recreationally, though Jacob Brothers Junk Yard is located in the east bank above Interstate 95. No commercial fishermen currently use the channel. Good physical accessibility is available from Hamilton, Cedar or Nichols Streets, all on the west bank; the east bank consists mainly of farms and much of it is fenced off. The area is quite noisy. Most park users will be from within a one-mile radius and a preponderance of curiosity seekers will probably visit the site during construction. One would expect more receptivity to this project than Fayerweather Island, as a filling of the channel has been considered on the past. A small increase in land value for those adjacent to the channel could well occur.

*There are several multi-family residences on the west bank and the unemployment rate is 25% in the immediate area.

Personal Interview	TWOTREE ISLAND/WATERFORD

Contact: Mr. Dimmock, Assessor
Town of Waterford
Town Hall
200 Boston Post Road
Waterford, CT

Telephone: 203-442-4489

The average baseline value for a residence within a mile of the site is $55,000. Since the market for houses in Southeastern Connecticut is skyrocketing, a loss in property value is not too likely. There are virtually no empty lots. A study done a few years ago indicated that even the construction of the Millstone Power Plant failed to have an impact on surrounding property values.

Personal Interview	TWOTREE ISLAND/WATERFORD	CEM

Contact: Lawrence Dettencourt, First Selectman Town of Waterford Town Hall 200 Boston Post Road Waterford, CT	**Telephone:** 203-442-4489

The populace will probably not be too concerned about a dredged material containment facility site since it is situated far enough away from land. However, there is the potential for a significant boating hazard; contact Captain John Wadsworth of the New England Boaters' Association at 203-443-7259 for further information.* Connection of the project with a "dumping" procedure will being people out of the woodwork. A low profile will dramatically change the situation. What will the effect be upon the 100-year flood level? Opposition is a matter of voice, not numbers, and facts must be presented. Who owns Twotree Island?

The composition of the dredged material with regard to potentail water pollution hazards should be known and indicated, as this will be asked.

*Unable to contact.

Personal Interview	TWOTREE ISLAND/WATERFORD CEM

Contact: Clint Brown, Town Planner Town of Waterford Town Hall 200 Boston Post Road Waterford, CT	**Telephone:** 203-442-4489

Waterford is presently undergoing a coastal planning process and it is unclear how a dredged material containment facility site will affect the shoreline. A project to expand the town landfill was recently defeated and effort should be expended to indicate that the goal of the project is not to create a landfill, or dump. There is some fishing off Millstone Point and the region is a popular recreational boating and commercial fishing area. Rescue guidelines using the town fireboat for the construction period should be established. Would there be temporary land quarters for workers? Whose responsibility will the land management and care be? The Coast Guard might have to be responsible for the removal of any illegal visitors, as the site is outside of police jurisdiction for the Town of Waterford. The distance of the site from shore also reduces the social impact as well. However, a building prohibition should be written into the deed.

Personal Interview	FAYERWEATHER ISLAND/BLACK ROCK HARBOR	CEM

Contact: Reginald Walker, Assistant Town Planner City of Bridgeport City Hall 45 Lyon Terrace Bridgeport, CT 06604	**Telephone:** 203-576-7603

Fayerweather Island is very flat and many boats can see the site. Although the waste treatment plant at the north end of Fayerweather Island is bankrupt, an addition to the landfill that lies just north of the site would be opposed most strenuously.* The best use for the site would be a passive recreation area for strolling, birdwatching, and observing the panoramic views. People have drowned near the lighthouse on the southern tip of Fayerweather Island, and night lighting on the site would help.

There is a tremendous number of boats moored in the vicinity of the site, both during the summer and the winter, and approximately 2300 people can see the site. Some residences in the area, especially the community of St. Mary's by the Sea, have a baseline value of $350,000 and more, though no change in price due to the project would be expected. There is reasonable access for a haul road if required, though many rocks in the area make walking difficult and the road, also, should be closed after construction. A city fishing pier exists at the very north end, but the shellfish in the region are not safe to take. (They must be left in clean water for some time first.) With adequate prior information regarding the intent and approach, the residents in the area would probably be receptive to the project, as it is sufficiently far away.

*The landfill can be seen from Seaside Park, a local cultural resource.

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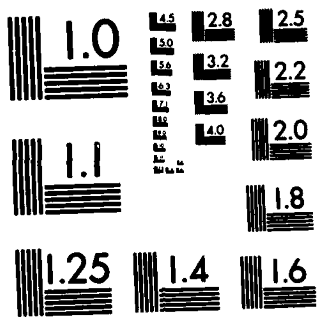

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Personal Interview

CLINTON HARBOR

CEM

Contact: Dan Vece, First Selectman
Town of Clinton
W.S.A.M. Town Hall
52 East Main Street
Clinton, CT 06413

Telephone:

203-669-9333
203-669-9090

A dredged material containment facility site that has a final usage as a marshland is a way to partially compensate for past marsh fillings. Questionable open water disposal could also be eliminated. The #6 red buoy could be moved over if necessary, to decrease boating hazards, and construction should not take place in the summer. If a haul road is required, it should be placed along the shoreline with a temporary bridge across the inlet to minimize impact. The site is a cleaning area for shellfish, though there should be no permanent employment displacement. Land values for Cedar Island would be expected to decline up to 10% if a waterfront is blocked. The project should be thoroughly presented and explained as the amount of general concern with a major project would range between 10% and 40% of the community.

A major determinant would be the height of the retaining structure. The dike should not extend much above the surrounding marsh grasses. A 10' high MLW dike would be strongly objected to. Noise and odors should not be a serious problem.

Personal Interview	CLINTON HARBOR	CE/M

Contact:	Telephone:
Charles Pitt Zoning Commission Town of Clinton W.S.A.M. Town Hall 52 East Main Street Clinton, CT 06413	203-669-6133

The Harbor Commission would know more about the boating hazards of such a project. The DEP could be of assistance regarding final use hazards at Hammonasset State Park. Ed Meehan of CREPA may be able to help regarding traffic congestion on the north shore of the Inner Harbor, a denss region. Reaction to dust could well be a function of the size of the site, though there probably wouldn't be too much. Cedar Island, to the northeast of the site, is a summer residential community with no phones and no electricity. There could be a potential for people to cross over along the dike wall onto Cedar Island. The First Selectman, Dan Vece, would know about expected public reaction. The Town Hall has a Historical Society Museum upstairs, which is a nearby cultural resource, and the Town Green, Waterside Lane, and the Stanton House have historical significance. The main visual incongruency of the site would seem to be the retaining dike structure. There would also seem to be potential flood plain problems regarding water displacement by the dredged material containment facility site and the means by which the created marsh will not dry out and wave action won't erode beachfront along Cedar Island, should be indicated.

Personal Interview	CLINTON HARBOR

Contact: John Phillips First Selectman Town of Madison	Telephone: 203-245-0494

The dredged material containment facility site would help the visibility of an otherwise bad location for boaters. The Vector Control Division of the Connecticut Department of Environmental Protection, located in Madison near Hammonassett, would be aware of potential vector problems associated with the site. Dust would seem quite unlikely to cross into the Inner Harbor, and the number and age of equipment used will determine the amount of gases generated.

Perhaps some of the acreage could be converted into additional parking facilities, in which case an access road would be needed. There could be a maximum adjacent property depreciation of 10% of market value (from the present, though future value is what is important).

The unemployment rate for Madison is quite low, averaging about 3%. The Madison school system could well end up sending roughly 1500 students a year to make bacteriological and wildlife studies of the developing marsh. Odors should not be a major problem as there is not much organic matter. Approximately 300 people live such that they can see the site, though the visual incongruence will be reduced if the dike is compatible with the existing breakwater. There is a likelihood that Madison interests would utilize any saleable sand and gravel, if available, as the local gravel pit is near depletion. Contact Ken Evarts, Seashore Construction Company at 203-245-9457 for further information. (unable to contact)

Personal Interview	BLACK LEDGE/NEW LONDON HARBOR	CEM

Contact: Mark Ofinger, Town Planner
Town of Groton
45 Fort Hill Road
Groton, CT 06340

Telephone: 203-445-8551

The best use for the dredged material containment facility would be as a wetland. As proposed, the site would force deep-draft recreational, as well as commercial vessels into the main channel, creating a boating hazard. There are many industrial users of the channel. Responsibility for the site would have to be given to the Coast Guard as the location is outside of the New Longon Police jurisdiction.* What would be the size of on-shore worker facilities, if needed? The region from Avery Point eastward is all residential, while Avery Point is institutional.

Who will maintain the site - Groton, or the State of Connecticut? Sewer discharge in the Thames has currently closed the shellfish to human consumption. However, there are many hard clams in the Pine Island Bay area. There will be no tax base if there is State ownership. Many people in the area want to be assured that siltation - or water interchange - problems will not occur. The town beach was rip-rapped, and turned into mud. An expected public reaction to the project will be greater than 10%.

Avery Point has several cultural resources, and the New London Lighthouse on New London ledge is an historically significant structure that is currently undergoing renovation by the Coast Guard. Trumbull Airport is nearby and the residents of Pine Island Bay and Cove are especially prone to mention any problems. The site will be visible from several local beaches and a golf clubhouse and dike 8' above MLW would obstruct the view.

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*The number of illegal visitors is a function of location to marinas and proximity to the shoreline.

Personal Interview	BLACK LEDGE/NEW LONDON HARBOR	CEM

Contact: John Kleen, Assessor Town & City of Groton 45 Fort Hill Road Groton, CT 06340	**Telephone:** 203-445-8551

In a recent sale in the Avery Point region, a house on 0.4 acres of land went for $70,000. The average 1978 evaluation for Avery Point area is approximately $78,000 for ½ acre or more, which is valued at least at $80,000 1981.

An initial expectation would be that no shore value effect is likely, since the site is far enough out. Even the building of a house just constructed on a rock n ear Hobbs Island had no effect. The main visual exposure center is the Waterfront Club, near Easton Point.

Personal Interview	BLACK LEDGE/NEW LONDON HARBOR	CEM

Contact: William Clinton, Chief Engineer City of Groton	**Telephone:** 203-445-9718

The flow near the site is generally pretty good. Further study should be undertaken, however, with regard to the specifics of the project.

Personal Interview	BLACK LEDGE/NEW LONDON HARBOR	CEM

Contact:	Telephone:
Catherine Kolanski, Mayor City of Groton 295 Meridan Street Groton, CT 06340	203-445-9718

There is some need in the City of Groton for open space, though more open housing is also required. The City of Groton Conservation Commission would have further information. Contact Mr. Chmura at 203-442-3701. Also, Bill Spicer and Mickey Weiss of Project Oceanology could be quite helpful. A secondary treatment sewage flow by Electric Boat and Pfizer Pharmaceuticals, into the Thames River, may occur, worsening conditions for shellfish in the region. The Coast Guard is not presently doing too much surveillance in the area but the site is in the Town of Groton Police Boat area. Mitchell College is a community resource located about 1½ miles away.

Telephone Contact	YELLOW MILL CHANNEL/BRIDGEPORT HARBOR CE/M

Contact: Vick Yanosey DEP Monitoring Hartford, CT	Telephone: 203-566-3310

In Groton, UCONN Avery Point, only ozone, no real problem with particulates.

Bridgeport trailer location - particulates + SO_2.

In 1980, there were two (2) violations of the 24-hour, secondary standard at 176,160 micrograms per cubic meter. The average in Bridgeport was a geometric mean of 64 micrograms per cubic meter. 150 micrograms per cubic meter is the legal limit for the secondary 24-hour standard and, although some days the figure comes close to this, it is not a problem since the area is mostly commercial.

Telephone Contact	YELLOW MILL CHANNEL/BRIDGEPORT HARBOR CE/M

Contact: Hank Gross Health Department City of Bridgeport	Telephone: 203-567-7495

In Yellow Mill Channel there are no muskrats, but rather rats. The area has been baited in the past and traps could be set at the south end of the site to catch them, as they would most likely continue to live near the water for most of the time.

Telephone Contact	YELLOW MILL CHANNEL/BRIDGEPORT HARBOR CEM

Contact: Anne McDonald Park Planner City of Bridgeport Bridgeport, CT	**Telephone:** 203-576-7722

A park would be a great idea. The area is "worse than Harlem," with Father Paneck Village to the west being about 95% black, but with many new Spanish speaking people moving into the area.

A ball field, soccer field or both would be most welcome. Funding could come from several sources. Corporate sponsors, such as Carpenter Steel, have supported Little League activities in the past. The location of the site in a Bridgeport Neighborhood Strategic Area (NSA) would allow Community Development Block Grant Funds to be applicable, with about $200,000 available in 1981. The salary of an extra maintenance man would be about $15,000 a year. Considering the situation in Washington Park where the comfort station was closed due to the selling of heroin from the premises, a rest room may well not be advisable.

Telephone Contact	YELLOW MILL CHANNELL/BRIDGEPORT HARBOR CEM

Contact: Inspector Mete Bridgeport Police Department	**Telephone:** 203-576-7722

There are no special requirements in regard to police services for a park in Yellow Mill Channel. For information as to local reaction, contact Dave Gonzales or Barbara Harden at Father Paneck Village.

Telephone Contact	YELLOW MILL CHANNEL/BRIDGEPORT HARBOR CE M

Contact: Mr. Handy Landscape Architect Bridgeport Park Department	**Telephone:** 203-576-7233

Currently there are thirteen maintenance personnel that care for the 980 acres in the Bridgeport Parks System. Most of the maintenance fees involved concern grass cutting and approximately 90% of these man-hours are spent trimming where the machines can't reach. A new park in Yellow Mill Channel would require approximately 1900 man-hours per year of cars, or one additional employee, based on comparisons to the requirements of other parks, especially Newfield Park.

Shade attracts people and planting trees would be a good idea; also rest room facilities would be needed. The need for restroom facilities would be especially apparent if athletic fields were to be put in. For a baseball field, the infield would cost about $6,000, the backstop would cost about $5,000. Softball leagues throughout the city would make good use of such a facility.

Telephone Contact	YELLOW MILL CHANNEL/BRIDGEPORT HARBOR	CDM

Contact: Bob Kalm Chief Engineer, City of Bridgeport City Hall 45 Lyon Terrace Bridgeport, CT 06604	**Telephone:** 203-576-6211

There are seven (7) storm drains into Yellow Mill Channel:

-- Hamilton Street - 27"
-- Sherman Street - 24"
-- Cedar Street - 10" x 15"
-- Church Street and Waterview Avenue - 36" x 42"
-- Seaview Avenue (overflow structure)
-- Seaview Avenue, just North of I-96 - 8"
-- Deacon Street - 36"

Further information may be obtained by calling the engineering department.

Telephone Contact	YELLOW MILL CHANNEL/BRIDGEPORT HARBOR

Contact:	Telephone:
Dr. James Crispino, Planning Director City of Bridgeport City Hall 45 Lyon Terrace Bridgeport, CT 06604	2C[illegible]-576-7193

There would be a very favorable perceived need for a park in Yellow Mill Channel. Drownings would be prevented and in addition to the excellent recreational opportunities afforded, there is a possibility for a summer educational program. Jacob Brothers Junk Yard is located on the east bank of the site and they utilize water transport. A junkyard is hard to relocate due to licensing and zoning requirements. Also, there are sewers running into Yellow Mill Channel. While there are many fences along the shores, particularly on the east side, there are many ways to get by, which is related to the social charactersitics of the population. The region is perceived to be the worst area of Bridgeport. While there is a distrust of local government in low income areas, if the project is presented properly by an agency of the Federal Government, there will be a much better reception, due to the resultant objectivity.

The D'Addario Sand and Gravel Company would in all probability be willing to purchase any saleable sand and gravel that would be available.

Telephone Contact	YELLOW MILL CHANNEL/BRIDGEPORT HARBOR CEM
Contact: Dave Gonzales Head of Bridgeport Housing Authority	**Telephone:** 203-336-4431

There is really a need for a park in Yellow Mill Channel. In the near future about $8.4 million are slated to be put into public housing. Those near the channel would get good treatment, since there is currently a fairly widespread movement in Bridgeport to change the City's image. Father Paneck Village near Yellow Mill Channel is perceived to be one of the worst areas. Over $40,000 a year are spent to replace windows in the public housing projects along. A park would go a long way toward reducing such vandalism. There are about 1800 children aged 5-18 in Father Paneck Village alone. Also, rats breed along the Channel banks and a fill-in will extinguish them to a large degree. There may well be as many rats as there are people in the area.

Telephone Contact	CLINTON HARBOR	CEM

Contact: Mr. Miller
Connecticut Parks Department
Hartford, CT

Telephone: 203-566-2304

The Clinton site has old clam flats with many clams and oysters, but a marsh could be more productive.

PLEASE fill in mosquito ditches - they don't drain evenly!! Foreign plants have taken over the ditches put in by the Mosquito Control Unit with a reverse effect. Also, please fill in parking lot at east end of pavillon, about seven (7) acres.

While there are lots of cut feet and fishhooks in skin, there are usually no serious injuries that require hospitalization.

Telephone Contact	CLINTON HARBOR	CEM

Contact: Hazel Ekstrom
Connecticut Parks Department
Hartford, CT

Telephone: 203-566-2304

Attendance at the Hammonassett Beach State Park for the 1979 season was:

795,620 visitors
137,221 campers

932,841 TOTAL

In the marsh portion of Hammonassett, a perigee flood usually runs off in one day.

Telephone Contact	CLINTON HARBOR

Contact: Mr. Elston Head of the Vector Division CT DEP Madison, CT	Telephone: 203-245-2198

Don't cut off any tidal circulation in existing wetlands; hopefully, this project will be done during winter. Even a half acre of ponded water would create quite a problem with gnats, greenhead flies and mosquitoes. Provisions for drainage <u>must</u> be made.

The 1970 Pawsom Park project in Branford, Connecticut was defeated by area petitions after residents learned there would be an insect problem since there were no plans for water circulation.

Telephone Contact	CLINTON HARBOR

Contact: Doug McGuire Shellfish Commission Town of Madison	Telephone: 203-669-5361

Many razor clams along the beach area in the Madison shellfish area. Contact Jay Milton Jeffreys of the Madison Shellfish Commission at 203-245-2478 for further information. Shellfish spawning is from June 5 to September 15.

Telephone Contact	TWOTREE ISLAND/WATERFORD	CEM

Contact: Steve Toth
Millstone Nuclear Power Plant
Waterford, CT

Telephone: 203-442-0751

What will be the effects of siltation upon the Millstone power plants due to the development of the site?

At Millstone there are a maximum of 2500 workers on the site per day.

Telephone Contact	TWOTREE ISLAND/WATERFORD	CEM

Contact: Mrs. Lambert
Northeast Utilities Energy Center
New London, CT

Telephone: 203-447-1791

There are approximately 400 full-time employees at Millstone, not including the construction workers from Stone and Webster who are building Millstone III.

Telephone Contact	TWOTREE ISLAND/WATERFORD CEM

Contact: Bob Porter Shellfish Commission Town of Niantic	Telephone: 203-739-5875

There are no shell or clam fishermen, though 10 to 15 lobstermen are active in season in the Waterford-East Lyme region.

Telephone Contact	TWOTREE ISLAND/WATERFORD CEM

Contact: Frank Utaro Seaside Regional Center Waterford, CT	Telephone: 203-447-0301

A total of 950 workers and patients are located in the Seaside Regional Center. The Center is within one mile of the site.

Telephone Contact	TWOTREE ISLAND/WATERFORD	CDM

Contact:	Frank Bohlen Marine Resource Hydrologist University of Connecticut Avery Point Groton, CT	Telephone: 203-446-1020, ext. 256

Wave diffraction and circulation must be studied.

Millstone is currently experiencing some sanding in the intake to Plant #2. How will wave characteristics change? Jordan Cove is politically sensitive. There is a sedimentation problem now and residents would have to be assured of no deleterious effects. Residents cherish the view from Eastern Point Beach, Shemmecconset Beach Club, and Pine Island Bay.

Telephone Contact	BLACK LEDGE/NEW LONDON HARBOR

Contact: Mr. Chmura
Conservation Commission
City of Groton
Groton, CT

Telephone: 203-442-3701

COMMENTS

- Site would act as a storm barrier for Shemmecossett Beach, City Beach at Eastern Point, Avery Point, public anchorage, Shemmecossett Yacht Club and two marinas.
- The site would allow prevention of erosion and boating damage.
- Winds from the southwest predominate, especially in summer.
- Dumping grounds already cause sedimentation (1 mile south of channel). Shouldn't increase sedimentation over reduction in water circulation already occurring.
- Call for more information.

Telephone Contact	BLACK LEDGE/NEW LONDON HARBOR

Contact: John Spicer
Groton Waterfront Commission
City of Groton

(also owner of Spicer's Marina)

Telephone: 203-446-1185

A containment site is a great idea! There would be storm protection, and the sedimentation wouldn't be too bad.

The area is currently pretty nasty with lots of rocks.

Telephone Contact	BLACK LEDGE/NEW LONDON HARBOR CEM

Contact:	Telephone:
Mr. Smollick Civil Engineering Office New York District of the Coast Guard	212-668-7341

Renovation of the New London Lighthouse is almost complete. Among the improvements are:

- Roof replacement
- Masonry work
- Concrete work
- New railings
- New fuel tank
- New doors and windows
- Exterior repainted
- Prepared for manning to aid navigation.

Telephone Contact	BLACK LEDGE/NEW LONDON HARBOR CEM

Contact:	Telephone:
Sue Hart New York District of the Coast Guard	212-668-7341

A possible problem for Black Ledge site is as follows. A wall with mean low water (MLW) of 20' will not interfere with the light at 58' MLW; however, east of the lighthouse there is a lobster area and approximately 10 people utilize the area for personal or commercial lobstering. The Block Island Ferry ahd heavy recreational traffic use the area filled in by the western cell. Decking and filling in the third cell would create a "potentially dangerous" situation. For more information on lobsters, see the New London Fish and Wildlife Association.

Telephone Contact	BLACK LEDGE/NEW HAVEN HARBOR CEM

Contact: Mickey Weiss Project Oceanology Avery Point, Groton, CT	Telephone: 203-445-9007

The site location is in a ridiculous place; a better option would be to use available open land to create a site adjacent to it up the Thames River above the Throughway. Black Ledge has high wave and current energy, and waves will reform around a dike wall (which may minimize storm protection, though the dike length is important here). The site is also presently a very healthy reef community and the ecological disruption would be relatively major. Also, any dike failure will mean loss of material into open water, possibly even into the channel. Information regarding sedimentation can be obtained from John Scillieri, Chairman of the Waterford Erosion and Sedimentation Committee.

Telephone Contact	GENERAL APPLICATION CEM

Contact: Jack Wilcox
Noise Division
Department of Environmental Protection
Hartford, CT

Telephone: 203-566-7494

Construction noises are exempt from standards due to their temporary nature. A soft-site (s-s) has little background noise, while a hard site (h-s) is near noise centers. Some standards set for a 50' distance with the vehicle moving perpendicularly at 35 mph are: cars 79 db (s-s), 81 db (h-s); motorcycles 82 db (s-s), 86 db (h-s); snowmobiles 78 db (s-s), 80 db (h-s); trucks over 10,000 lbs 90 db (s-s), 92 db (h-s); and school buses 88 db (s-s), 90 db (h-s). Stationary standards at 50' for cars is at 72 db (s-s), 74 db (h-s) and trucks at 80 db (s-s) 88 db (h-s).

Doubling the distance decreases the decibel level by almost 6 db.

Telephone Contact	GENERAL APPLICATION	CEM

Contact:	Telephone:
Jim Regan, Underwriter Travelers Insurance Company Hartford, CT	203-277-0111

LIABILITY
NON-EMPLOYEE BASE RATE 1981*
[per $100 payroll]

Job	Bodily Injury	Property Damage
Grader	.45	.59
Excavator	1.20	1.50
Electrician	.21	.24
Mason	.33	.18
Carpenter	.43	.28
Dredger	.82	1.10
Driller	.31	.58
Executive Supervisor	.57	.33

WORKER'S COMPENSATION*
(Bodily Injury)
[per $100 payroll]

Grader	$ 6.11
Excavator	6.11
Electrician	4.10
Mason	11.28
Carpenter	9.00
Dredger	N/A
Driller	16.20
Executive Supervisor	5.47
Coffer dam (which includes pile driving & substructure only)	19.68

*NOTE: Figures are for Connecticut only

Telephone Contact	GENERAL APPLICATION CDM

Contact: Richard Soj Air Quality Engineering Division Connecticut Department of Environmental Protection	Telephone: 203-566-2690

The following are rates of "fugitive dust" (particulates from open areas) generation from EPA Report EPA901/9-78-005, "Inventory Development for Evaluation of Measures for the Control of Non-traditional Sources of Particulates in New England." (for Bridgeport):

- Railroad track = 0.004 tons per acre/year
- Cleared but undisturbed area = 0.005 tons/acre/year
- Storage area with piled debris = 0.039 tons/acre/year
- Unpaved parking = 0.526 tons/acre/year
- Construction activities from wind and machinery = 0.448 tons/acre/month.

Telephone Contact	GENERAL APPLICATION CEM

Contact: Dave Pourier Connecticut Historical Commission Hartford, CT	**Telephone:** 203-566-3116

- Information to be mailed -

Telephone Contact	GENERAL APPLICATION CH2M

Contact: Helen Mileska
Sociologist
Army Corps of Engineers
Norfolk District
Norfolk, Virginia

Telephone: 801-441-3500, ext. 3767

The Craney Island dredged material containment facility outside of Portsmouth, Virginia is presently a wetland; but a future use may be industrial. The island itself poses no boating hazards, but the dredging activities do pose difficulties. There seems to be no direct vector problem created by the site, although it is not known if the island has been sprayed. The island has had a relatively low attractiveness of destination.

The site is presently under the jurisdiction of the Army Corps of Engineers, and acceptance by local residents has been good; although the site is remote from any residential area. No complaints of odors have been heard. The site is also no more obtrusive than other activities in the area, even though the site has not yet been totally completed.

Telephone Contact	GENERAL APPLICATION	CEM

Contact:	Telephone:
Dr. Dick Lee U.S. Army Engineer Waterways Experiment Station Vicksburg, Mississippi	601-634-3585

Decreasing pH increases contaminant mobility. Material from Johnson Creek and Black Rock Harbor with a 14% sulphur content went from a pH of 7.3 to 6.8 when exposed to air. In contract a site in Baltimore with a 28% sulphur content went from a pH of 7.2 to 5.5 as the sulphur oxidized.

H_2S won't go through too much water; therefore a water column over a site prevents most odors. Oxydation of sulphur when this water is removed causes a crust to form. In Mississippi in the summer this happens in a few hours. Variables that should be considered are the settling rate of the slurry, the water drainage rate, the salinity (salt water allows generally faster settling), the amount of rain during dewatering (the more that occurs, the longer the crust takes to form), the temperature, and any other vaporization considerations.

Telephone Contact	GENERAL APPLICATION CEM

Contact: Tony Fuschillo Occupational Safety & Health Administration Hartford, CT	**Telephone:** 203-244-2296

Requirements for operator of heavy machinery:

- o under 90 db for 8 hours (minus time for breaks against time in violation)
- o under 115 db for 1/2 hour.

Although a bulldozer and the like can reach a level of 95 db at near full tilt, in the open this is generally acceptable, since the duration of such a level does not exceed the time for work breaks. Mitigation for workers with ear protection or a sound partitioned cab is allowed.

Telephone Contact	GENERAL APPLICATION

CEM

Contact: Jim Baxter Army Corps of Engineers Mobile District Mobile Harbor, Alabama	**Telephone:** 205-690-3441

The dredged material containment facility site in Mobile Harbor is an island wetland remote from the surrounding population of about 250,000.

The dikes were built with dredged material; the material used initially was high sand content, then filled in with fine unconsolidated material. There is nighttime fishing for flounder and also one instance of a person sinking in mud and silt. Local shrimpers work right in the plume emanating from the structure.

The State owns the land the island sits on while the Army Corps of Engineers owns the land and is believed to be ultimately responsible.

The island has become a refuge for Brown Pelicans after an absence from the area for years. Environmentalists who at first opposed the project have been pleasantly surprised with its outcome.

The channel dredging enhanced local industrial development and therefore increased local land values. The dikes, though 10 to 15 feet high, have had little effect on the area panorama.

Telephone Contact	GENERAL APPLICATION CEM

Contact:	Telephone:
John Baker Aquaculture Division Department of Environmental Protection Milford, CT	203-874-0696

Generally, opposed to all sites. He wants them put upland. There is a potential for 100-year flood problems at each site. Furthermore, he is opposed to all sites except Yellow Mill Channel, due to shellfish population at each. Shellfishermen usually work "beds as available" in crews of roughly 12 people.

Anyone wishing further information should please call John Baker, at the above phone number.

Again, all sites except Yellow Mill Channel have many shellfish and this is a serious situation.

Telephone Contact	GENERAL APPLICATION CEM

Contact: Mr. Moran Moran Sand and Gravel North Stonington, CT	Telephone: 203-599-1065

Availability of sand and gravel suitable for use as construction material and/or ice control for roads is an important need in the region. Available sources are becoming increasingly limited in total and in locations near prospective use points. Currently, bank run sand and gravel for ice control on roads costs about $5 to $6 per cubic yard, although this price is strongly influenced by distance of source from point of use.

The potential use of coarse grained sand and gravel materials obtained from a dredging project is interesting. One can see no reason why such material could not be used if it is relatively clean, accessible, and close to points of use.

APPENDIX C

Long Island Sound Overview: Detailed Analysis of Employment In Connecticut and the New York City Region (1970 through 1980)

C.1 BACKGROUND

This appendix contains summaries of a detailed analysis of annual county employment data for the New York City region and Connecticut from 1970 through 1980 provided by the Bureau of Labor Statistics of the U.S. Department of Labor and the Connecticut Department of Labor, respectively. In the material to follow, employment numbers have generally been rounded to the nearest thousand.

C.2 EMPLOYMENT IN CONNECTICUT: 1970-1980

Construction (49,000 employees in 1980)

The Connecticut construction industry began the Seventies with 57,000 employees, and grew slightly to 60,000 in 1973, apparently unaffected by the sharp decline in manufacturing in 1971. In the next three years, employment declined sharply to 41,000 in 1976. It recovered to 52,000 in 1979, and dipped again to 49,000 in 1980. There are indications of strong growth in commercial building construction in the Hartford region in the Eighties, including statements by the Greater Hartford Chamber of Commerce that office space in the region will double by 1985. In several instances the new construction is being financed by insurance companies seeking to create space for anticipated expansion. As these new employment opportunities are filled, it can be expected that there will be a resurgence in home building, where building permits dropped from a high for the decade of nearly 25,000 units in 1972 to a low of slightly more than 10,000 units in 1980. Between those extremes, the building of single family detached homes fell by about 50 percent, and the construction of multifamily units fell by more than two-thirds. Yet, with this significant decline in construction, Connecticut had 177,281 more housing units in 1980 than it did in 1970, a factor of well over twice the 75,000 increase in population. It is likely that the increase in new office space will mean new job opportunities, in turn creating new demand for residential housing. The ratio of construction of privately owned homes to rental units will doubtlessly depend on inflation and mortgage interest rates. Should the present administration be successful in significantly reducing inflation, there could be a boom in private home building. If inflation and interest rates remain high, then construction of a larger proportion of rental units is likely. The picture for construction in Connecticut in the Eighties is generally much brighter than the slump of the Seventies. However, a nationwide recession or a new energy crisis could, at anytime, cause a postponement or cancellation of commercial building, thus undermining the cornerstone for employment growth in the construction sector in the Eighties.

Metallic Manufacturing (329,000 employees in 1980)

The metallic manufacturing (durable goods) industry is considered to be the industrial basis for Connecticut employment. It employs many highly skilled workers and pay is high. It has provided relatively stable employment throughout the Seventies, although it experienced sudden drops of about 40,000 employees in the recessions of 1971 and 1975. Transportation Equipment employed 88,000 in 1980, essentially the same as 1970. Fabricated Metals, Machinery, and Electrical Equipment employed 66,000, 63,000 and 52,000, respectively, in 1980, representing little change for the first two, but a 13 percent growth over 1970 for the latter. Instruments and Clocks, and Primary Metals, employed 27,000 and 21,000 in 1980—a 28 percent gain for the first and a 16 percent loss for the second, compared to 1970.

Nonmetallic Manufacturing (118,000 employees in 1980)

Within the nondurable goods manufacturing sector, Printing and Publishing has the largest number of employees: 24,000. It also has shown the second largest sector growth during the Seventies, with an increase of 20 percent. Chemicals, with 19,800 employees in 1980, had the largest growth in the decade: 27 percent. Textiles began the decade with 13,000 employees and dropped to 8,000 in ten years, a 38 percent decrease, the largest in all the manufacturing activities. The Food and Apparel activities had about the same number of employees as Textiles and saw employment decline by 7 and 15 percent, respectively. Rubber and Related Products experienced an employment decline from 16,000 to 14,000, while Paper showed a small increase from 9,000 to 10,000 over the period. Employment in Furniture and Wood Products remained essentially constant at about 7,000 employees.

Transportation, Communications, Utilities (61,000 employees in 1980)

This employment sector experienced a 13 percent growth between 1970 and 1980, with employment increasing from 54,000 to 61,000. However, almost all of that growth was in transportation, which increased over 18 percent, from about 27,000 to 32,000. Communications increased only about 6 percent, from 17,000 to 18,000, while employment in utilities remained essentially constant at about 11,000.

This employment sector will probably continue its lopsided mild growth pattern throughout the Eighties and beyond, with most of the employment increase in transportation.

Trade (299,000 employees in 1980)

Trade is one of the higher growth employment sectors in Connecticut. Its 33 percent growth from 225,000 employees in 1970 to 299,000 in 1980 includes an increase in every year, although small in the 1971 and 1975 recession years. Growth was highest in the Restaurant sector, which saw employment increase a dramatic 71 percent, from about 38,000 in 1970 to 65,000 in 1980. Employment in Wholesale Trade increased 51 percent, rising steadily from about 49,000 in 1970 to 74,000 in 1980. The largest employment activity, Retail Trade except Restaurants, rose from about 137,000 in 1970 to 160,000 in 1980, an increase of one-third. It experienced a very small decline during the 1976 recession year.

The Seventies may have been the period in which Trade responded to high personal income in Connecticut, and grew with demand. However, facilities to support much of that demand are now available. While more employment growth is likely in the Eighties, it is unlikely that it will continue to surge as it has in the past. More likely, growth in Trade will be more closely correlated to population and construction growth. A serious recession might have considerable adverse impact on this sector, especially among Restaurant employees, where employment was approximately constant in 1979 and 1980, perhaps the beginning of a much lower growth rate in the future.

Finance, Insurance and Real Estate (105,000 employees in 1980)

This employment sector grew steadily throughout the decade, from about 74,000 in 1970 to 105,000 in 1980, an increase of 42 percent. Its growth slowed for the 1975-1976 recession, but did not dip. The larger growth was in Finance and Real Estate, which grew 45 percent, from 31,000 to 45,000. However, Insurance also showed strong growth in moving from about 43,000 to 59,000—a 37 percent gain.

Connecticut's high per capita income and ability to continue to maintain its manufacturing level and increase nonmanufacturing employment appears to offer support for continued growth in Finance and Real Estate, although a recession, or a slow-down in commercial building construction could abate or temporarily reverse growth in these sectors. Insurance employment in Connecticut is much more dependent on sales activity outside the state. Thus, growth of population and booms in regions remote from Connecticut stimulate and support growth in the insurance industry here. There is little reason to expect that those conditions will not continue in the future. However, should something influence the present structure within the state--such as a personal income tax or unbearable corporate taxes—the future of employment in the state could be grim, because much of Connecticut's growth in the Eighties may center around new office building construction, financed by insurance companies, in part to accommodate their own corporate growth needs.

Service (286,000 employees in 1980)

This major employment sector has grown more during the Seventies than any other in Connecticut. It has increased 102,000, with a relatively steady growth from 184,000 in 1970 to 286,000 in 1980, or more than 55 percent. Law and Professional Services employment has increased the most—about 87 percent—from about 11,000 to 20,000 employees. Health Services follows, going from about 57,000 to 95,000, or 67 percent. Employment in Laundry and Personal Services remained approximately constant at about 15,000, although this included a dip to about 13,000 in 1974, 1975, 1976 and 1977, and slow recovery thereafter. The largest growth has occurred in the remainder of the Services sector, which saw a growth of about 57 percent, as employment grew from about 95,000 in 1970 to 149,000 in 1980. This large group includes business services, automotive and other types of repair services, motion pictures and other amusements, education and social services, etc.

As Connecticut grows in population and employment during the Eighties, the Service sector will probably continue to be in the forefront, although the rate of growth is unlikely to accelerate as it has in the past.

Government (183,000 employees in 1980)

Federal, state and local government employees in Connecticut increased nearly 16 percent between 1970 and 1980. Employment increased from about 158,000 in 1970 to 183,000 in 1980. Federal government employment rose only about 5 percent, from 21,000 to 22,000. State employment, including both full and part-time, was about 45,000 in 1970, and grew to nearly 49,000 in 1980, an increase of about 9 percent. Local government employment grew from about 92,000 in 1970 to 112,000, increasing nearly 22 percent.

In 1970, the ratio of local-government-employees-to-population was 1:33; by 1980 this had increased to 1:28. It is doubtful that this ratio will continue to increase much. In fact, because the number of public education employees is expected to decrease in the future, and the birth rate is not expected to increase markedly in the future, the ratio may decrease somewhat during the early part of the Eighties.

C.3 EMPLOYMENT IN THE NEW YORK CITY REGION: 1970-1980

Construction (127,000 total employment in 1980)

Employment in Construction in New York City dropped from 114,000 in 1970 to 66,000 in 1977, recovering slightly to 75,000 in 1980, for a net loss over the decade of 39,000 or a 35 percent decline. In Nassau-Suffolk Counties, employment in Construction grew from 39,000 in 1970 to 47,000 in 1973, declining to 35,000 in 1976-1977, and

recovering somewhat to 37,000 in 1980, leaving a net loss of only about 2,000, or a 5 percent decline. In Westchester County, Construction employment of 19,000 in 1970 was equalled in 1973. It fell to about 12,000 in 1976-1977, rising to 15,000 in 1980 for a net loss of about 4,000, or a 21 percent decline. Throughout the New York City region, Construction employment of 172,000 in 1970 declined 45,000 to 127,000 in 1980, a reduction of 26.2 percent, almost twice the percentage loss in Connecticut.

While losing considerable population, the New York City region had an increase in housing of more than 4 percent, adding more than 167,000 housing units. This is, however, less in numbers than the 177,000 housing units added in Connecticut, which has less than one-third the population of the New York City region. Bronx and Kings Counties lost nearly 80,000 housing units, leaving a deficit of over 7,000 housing units in New York City for the decade.

Manufacturing (743,000 total employment in 1980)

Manufacturing employment in New York City stood at 766,000 in 1970, or 20.5 percent of its nonagricultural employment. By 1980, it had dropped to 499,000, representing a loss of 267,000 jobs, a 35 percent decline, making Manufacturing employment only 15.1 percent of all nonagricultural employment in New York City. There is no evidence that the end to decrease in employment in this sector is in sight. The rate of employment loss was slightly higher in Durable Goods Manufacturing (40 % decline), in comparison to Nondurable Goods Manufacturing (33 % decline). Approximately 23 percent of New York City's manufacturing employment was in durable goods in 1970, but this dropped to 21 percent in 1980.

In Nassau-Suffolk Counties, manufacturing employment of 153,000 in 1970 grew 9 percent to 167,000 in 1980, with declines experienced in 1971 and 1975. Slightly more than two-thirds of this employment was in durable goods manufacturing.

Manufacturing employment of about 74,000 in 1970 in Westchester County experienced a decline to 62,000 in 1975, and recovered to 75,000 in 1980, showing a small gain over the decade. Somewhat more than half of this employment is in the durable goods sector.

Overall, employment in manufacturing in the New York City region fell approximately a quarter of a million in the Seventies, from about 943,000 to 741,000. While representing about two-thirds of the manufacturing employment, the nondurable goods sector experienced about three-fourths of the job loss. In contrast, nearly three-fourths of Connecticut's manufacturing employment is in Durable Goods, and it posted a modest 5 percent increase over the Seventies.

Transportation, Communications, Utilities (315,000 total employment in 1980

New York City has seen employment in this sector drop more than 20 percent, from 323,000 in 1970 to 257,000 in 1980--a loss of 66,000 jobs. Employment in this sector in Nassau-Suffolk Counties rose by 6,000 (18 %), from 33,000 in 1970 to 39,000 in 1980. In Westchester County, employment in Trans/Comm/Util began and ended the decade at about 19,000, but there was a decline to about 17,000 employees in 1976, followed by a slow recovery.

The New York City region experienced a net loss of 60,000 jobs (16 % decline) in the Trans/Comm/Util sector during the Seventies. Employment in New York City was continuing to decline in 1980, while there was some slight growth in Nassau-Suffolk Counties and a stable level of employment in Westchester County. It is not likely that this sector will experience a further significant employment decline. Recovery of population growth and/or increased availability of mass transit could cause a rise in employment.

Trade (927,000 total employment in 1980

Employment in Wholesale and Retail Trade in the New York City region dropped 68,000 during the Seventies—a decline of nearly 7 percent from 995,000 in 1970 to 927,000 in 1980. There was a loss of about 120,000 jobs (16 % decline) in New York City, distributed almost equally between Wholesale Trade, which lost about 57,000 jobs (19 % decline) and Retail Trade, which experienced a drop of about 64,000 in employment (16 % decline). The decline in employment in Trade in New York City, from 735,000 in 1970 to 615,000 in 1980, was at a rate of more than one-and-one-half times greater than the loss of population, probably reflecting the impact of higher overhead and labor costs in the City, relative to the outlying counties. Employment in Eating and Drinking Places in New York City, which is about one-quarter of employment in the Retail Trade sector, declined slightly over the decade, dropping from about 118,000 in 1970 to 102,000 in 1975, and then recovered slowly to about 113,000 in 1980, for a net decline of about 4 percent.

Only a part of New York City's loss of employment in Trade was captured by its neighboring counties. Nassau-Suffolk Counties saw their Trade employment grow from 191,000 in 1970 to 239,000 in 1980, an increase of about 48,000, or 25 percent. About three-quarters of this employment is Retail Trade, which added 26,000 employees for a growth of 17 percent. Wholesale Trade grew by 23,000 employees, adding 56 percent to the 1970 employment of 39,000.

Although Westchester County lost 3 percent of its population, employment in Trade climbed from about 69,000 in 1970 to 83,000 in 1980, a growth of about 14,000 or 20 percent. This increased employment was approximately equally distributed between Wholesale and Retail Trade, although constituting a 37 percent increase in Wholesale Trade employment and only about a 14 percent increase in Retail Trade employment.

As in New York City, employment in Eating and Drinking Places constitutes about one-fourth of the Retail Trade employment in Nassau-Suffolk County and Westchester County. However, there were employment increases over the decade of about 10,000 and 5,000, respectively, constituting growths of about 37 and 50 percent.

Finance, Insurance, Real Estate (516,000 total employment in 1980)

Employment in Finance, Insurance and Real Estate (FIRE) in the New York City region essentially held its own during the Seventies. A loss of about 12,000 employees (2.6 % decline) in New York City was offset by increases in employment of about 19,000 (more than 57 %) in Nassau-Suffolk Counties and 4,000 (over 28 %) in Westchester County. The New York City region experienced about 2 percent employment growth in this section, from 505,000 in 1970 to 516,000 in 1980.

In New York City, employment in FIRE was 458,000 in 1970. It fell steadily to 414,000 in 1977, and then recovered sharply to 446,000 by 1980, ending the decade with a net loss of only 12,000 employees. Within the FIRE sector, employment over the decade was up slightly in Banking, Credit Agencies, and Insurance Agents and Brokers. It was down in Security and Commodity Brokers, Insurance Carriers, and Real Estate.

Employment in FIRE in Nassau-Suffolk Counties grew steadily and strongly throughout the Seventies, posting the highest percent increase (over 57 %) of any major employment sector in any part of the New York City region, discussed herein. It grew from about 33,000 in 1970 to 52,000 in 1980, increasing by 19,000. Part of this growth may be due to the shift in population (825,000 lost by New York City, 157,000 added in Suffolk County, 107,000 lost by Nassau County), while much is likely due to increases in branch offices, etc. In Westchester County, employment in FIRE increased by about 4,000, from about 14,000 in 1970 to 18,000 in 1980.

With New York City recovering most of its FIRE employment following the 1977 low point, growth in Nassau-Suffolk and Westchester Counties has slowed. It is unlikely that there will be significant growth in this sector in the future. Continued application of computerization of operations in the banking, securities, and commodities sector will help to accommodate increases in work volume without significant

numbers of new employees. Employment will probably follow population shifts, declining somewhat if the region's population continues to fall, and vice versa. Of more importance would be the impact of moves by the major banking institutions, or the stock exchanges, to locations offering lower overhead and/or taxes. Such an event could be a major disruption in the financial and investment infrastructure in New York City and could result in very significant future employment pattern changes. Presently, there are no strong indications that such major disruptive shifts will occur soon. However, the future remains uncertain.

Services (1,180,000 total employment in 1980)

The Services employment sector was the only major sector in New York City to show growth during the Seventies. Beginning with 786,000 employees in 1970, Services declined in 1971 to 772,000, then grew to 789,000 in 1973, followed by a decline to 767,000 in 1976. From that point there was a steady growth to 889,000 in 1980, leaving an increased employment of 103,000 (13 %) for the decade.

In Nassau-Suffolk Counties, employment in Services grew steadily throughout the decade, from 132,000 in 1970 to 203,000 in 1980, giving an increase of 71,000 or almost 54 percent. A somewhat similar pattern was followed in Westchester County, where there was continued growth from 64,000 in 1970 to 88,000 in 1980, an increase of about 24,000 or over 37 percent.

Combining these results, employment in Services in the New York City region grew from 992,000 in 1970 to 1,180,000 in 1980, a 20 percent increase of 188,000 new jobs. This could be compared with employment in Services in Connecticut, which increased by 102,000 (55 %). As a further interesting point, in Connecticut, employment in Services went from about 15 percent of all nonagricultural employment to 20 percent during the Seventies. In the New York City region, it went from about 21 percent to 26 percent.

Government (750,000 total employment in 1980)

Although the New York City region lost 802,000 in population (7.1 % decline) and 212,000 in employment (4.4 % decline), employment in the Government sector remained essentially constant. However, shifts among the federal, state and local government employment sectors did occur. In particular, federal government employment dropped from about 129,000 in 1970 to 114,000 in 1980, a reduction of over 11 percent. Local government employment also fell, dropping slightly from 556,000 in 1970 to 550,000 in 1980, a decline of about one percent. However, state government employment rose from 67,000 in 1970 to 86,000 in 1980, an increase of 28 percent.

In New York City, federal government employment dropped by more than 18 percent in the Seventies, from about 108,000 in 1970 to 88,000 in 1980. State government employment grew by more than 28 percent, from about 41,000 to 53,000. Conversely, local government employment dropped 9 percent, from 415,00 to 376,000, approximately maintaining a local-government-employment-to-population ratio of about 1:19 over the decade. Combined, government employment in New York City went down about 46,000 (8 %) over the decade.

All sectors of government employment went up in the Seventies in Nassau-Suffolk Counties, with federal government employment rising about 4,000 (26 %) from 15,000 to 19,000. State government employment rose over 20 percent, from about 24,000 to 29,000. Local government employment increased nearly 24 percent, from about 105,000 to 130,000. This caused the local-government-employment-to-population ratio to go from 1:24 in 1970 to 1:20 in 1980. Combining all government employment in Nassau-Suffolk Counties, there was an increase of about 19,000 employees (28 %), from 67,000 in 1970 to 86,000 in 1980.

Westchester County lost over 3 percent of its 894,000 population in the Seventies, but government employment increased in all sectors. Federal government employment went from about 6,000 to 7,000 employees, a rise of about 17 percent. State government employment increased from about 3,000 to 4,000, a growth of about 33 percent. Local government employment rose by about 8,000 employees (22 %), from 36,000 in 1970 to 44,000 in 1980. This means the local-government-employment-to-population ratio changed from about 1:25 to 1:20, essentially the same shift that occurred in Nassau-Suffolk Counties, making this ratio in 1980 very nearly the same throughout the New York City region. In contrast, the ratio was 1:28 in Connecticut in 1980.

APPENDIX D

ANALYSIS OF DREDGING/DISPOSAL PERMITS IN NEW ENGLAND: 1979 AND 1980

4.0 ANALYSIS OF SINGLE-ACTIVITY PERMITS FOR DREDGING/DISPOSAL ACTIVITIES *

Traditionally, dredging activities have taken one of two forms—i.e., Operations and Maintenance (O&M) dredging, which involves the removal of material filling previously dredged channels and basins; or Improvement dredging, which involves new work such as deepening and/or widening existing channels and basins or creating new channels and basins. By and large, however, it is the disposal of dredged material that accounts for the fact that these activities now collectively constitute an extremely environmentally-sensitive issue, more so than the actual disturbance caused by the dredging itself.

The major reason for this involves the fact that the material dredged is often contaminated by a variety of pollutants—particularly the unconsolidated silts and fine substances removed by maintenance dredging, or the surface or near surface layers excavated by improvement dredging. In Connecticut and New York, bottom sediments are hierarchically classified according to the extent to which they are contaminated, as follows:

- Class I Sediments
  - Composition: coarse-grained materials with high solid content.
  - Pollutant levels: low
  - Suitability disposal:
    - Open water disposal
    - "Capping" or covering other more-polluted materials
    - Beach nourishment.
- Class II Sediments
  - Composition: fine-grained materials with moderate solids content.
  - Suitability for disposal: determined on a case-by-case basis.
- Case III Sediments
  - Composition: fine-grained sediments with low solids content.
  - Suitability for disposal: under carefully controlled conditions and strict conditions.

To generalize, finer sediments (silt, clay) contain higher levels of contaminants than course materials (sand, gravel). For this reason, it is an often maintained rule of thumb that dredged material from improvement dredging operations is often "cleaner" than that produced by maintenance dredging.

Individual permits for dredging/disposal activities are issued by the Corps pursuant to either Sections 10, Sections 10 and 404 or Sections 10 and 103.

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*Extracted from CEM Report 4280-06-732, *General Permit Study for the Six New England States*, August 1981.

4.1 General Permit Guidelines for Dredging/Disposal Activities

Although it is not apparent to what extent general permit guidelines have already been developed for the New England states, in general, the process for developing such guidelines could conceivably take the following form:

- o Develop a detailed inventory of sediment classes (I, II or III) of bottom material for specific geographic areas.
- o Identify sites or facilities appropriate for disposal of these classes of sediments; whether they are existing or in the planning stage only.
- o Evaluate the potential individual and cumulative impacts of the activities to be regulated under the general permit.

Input for the evaluation would come largely from relevant agencies, from potential permittees, as well as from members of the general public at large.

Identification of appropriate disposal sites or facilities could take one of two forms:

- o Outlining basic specifications that the disposal site would have to meet for a given area or class of sediments.
- o Designation of an actual existing containment facility for disposal purposes.

This identification could be as specific as the actual name and location of an existing containment facility, or as general as a condition of the permit that "material shall be contained to prevent runoff from re-entering waterway at any point."

4.2 Classification of Dredging/Disposal Activities

For the most part, no elaborate classification effort was required prior to the analysis of single-activity permits regulating dredging/disposal activities. Using only a limited number of criteria, 96 of a total of 101 single-activity permits were accommodated by the following classification scheme. The number of permits assigned to each category is indicated in parentheses:

- o Section 10 permits only (27)
- o Section 10 and 404 permits (42)
  - Beach nourishment (5)
  - Upland/contained disposal (10)
  - Open water disposal (27)
- o Section 10 and 103 permits (12)

Improvement Dredging (15)

- o Section 10 permits (9)
- o Section 10 and 404 permits (6)

Three permits were excluded from subsequent analyses, since they involved the excavation (by hand or by shovel) of a small number of stones and boulders from the waterway adjoining the permittees' property. An additional two permits were discarded (#80066 and #80153) since they could not be uniquely classified according to the above scheme.

4.3 Enumeration of Permit Attributes

This section contains a set of tables which enumerate, for each group, relevant attributes of the permits in question. Among other things, these tables contain information pertaining to:

- Permit ID
- State
- Waterway type
- Method of dredging
- Depth (feet below MLW) to which dredging takes place
- Area (square feet) in which dredging takes place
- Volume (cubic yards) of material dredged
- Type of material dredged
- Disposal site
- Agency objections (name of agency and nature of objection)
- Objections from the general public (number of objectors is recorded, along with a list of non-redundant objections raised)
- Description of mitigation, if any
- Special conditions attached to permit
- Significant environmental and social impacts
    - Short-term adverse
    - Short-term beneficial
    - Long-term adverse
    - Long-term beneficial

In each table, permits are ranked (in ascending order) according to the total volume of material dredged.

4.3.1 Operations and Maintenance Dredging

This subsection is devoted to the analysis and discussion of the 81 single-activity permits pertaining to maintenance dredging/disposal. Various sub-categories include Section 10 only, Section 10 and 404, and Section 10 and 103 permits.

Section 10 Only Permits (Upland Disposal)

Tables 22, 23 and 24 depict the key attributes of the 27 Section 10 (only) permits authorizing maintenance dredging and disposal. By reference*, we know that all dredged material either conforms to Class I specifications or will have their runoff contained (each of these permits involve the use of an upland site for disposal).

Only 7 of these permits involved serious objections, and all were resolved by mitigation or special conditions written into the permit. The most frequent reason for objections involved the disposal site. Whenever objections were raised, the site was relocated to the satisfaction of all. In terms of special conditions, all permits in Tables 22 to 24 with the condition "90-day notice for periodic O&M dredging required" stated authorize the permittee to conduct periodic maintenance dredging for a time not to exceed 10 years from the date of permit issue.

Summer restrictions on dredging activity are often intended as a means of malodor abatement, since between October and May more of the population is indoors, and the prevailing breezes tend to blow offshore. In the case of rivers, April and May restrictions on dredging are often intended to prevent disruption of shad and salmon migration.

As far as significant environmental and social impacts are concerned, there are in most cases short term adverse impacts upon water quality, air quality and noise—as well as upon benthic flora and fauna in several cases. To a small extent, water quality, air quality and noise impacts are related to the method of dredging, although on a short-term basis, they are for all intents and purposes practically unavoidable. In only one instance did the permit activity result in significant long-term adverse impacts on the benthic population.

In the majority of cases, the disposal site involved either the permittee's property or the local town landfill. Tables 22 to 24 do not indicate that any appreciable relationship exists between the volume of material dredged and both the incidence and type of either objections, mitigation, special conditions, or environmental/social impacts (either beneficial or adverse).

Section 10 and 404 Permits

This class of permits for maintenance dredging/disposal permits can be further differentiated according to the characteristics of their disposal sites, to yield three distinct subgroups of Section 10 and 404 permits: those whose disposed material will be used for beach nourishment, those characterized by upland disposal (with effluent re-entering waterway), and those characterized by open water dumping.

*Class II and II sediments require a Section 404 permit, as well as a Section 401 Water Quality Certification.

TABLE 22

SUMMARY OF SECTION 10 OPERATION AND MAINTENANCE (O & M) DREDGING PERMITS (75 cu yd - 450 cu yd)

No.	Port/Town/City	ID No.	Permit No.	State	Waterway Type	Dredging/Disposal					
						Method	Ft Below MLW	Area (sq ft)	Volume (cy)	Type of Material	Disposal Site
		154	80174	ME	Bay	Bucket	Unk	1,634	75	Backwash	Upland
1.	Westbrook	071	80115	CT	River	Dragline	-5	3,850	80	Mud & silt	Upland-contained
		410	79167	MA	Tidal river	Bucket	-5	1,200	100	Mud & sand	Upland-contained
		191	80309	MA	Tidal river	Hydraulic	-6	6,400	100	Sand	Upland
		118	80132	MA	River	Dragline	Unk	5,000	150	Silt	Upland
		325	80064	ME	Tidal river	Clamshell	-1.6	3,500	200	Mud, sand, rock	Upland
		023	80286	ME	Bay	Bucket	-2	2,880	200	Sand, gravel	Upland-contained
		305	80233	MA	River	Bucket	Unk	Unk	355	Bottom sediment	Upland
		319	80227	MA	Harbor	Bucket	-12	4,400	400	Silt	Upland
		340	79177	MA	Harbor	Dragline	Unk	Unk	450	Silt	Upland

No.	Port/Town/City	ID No.	Permit No.	Objections		Mitigation	Special Conditions
				Agency	General Public		
		154	80174	None	None	None	None
1.	Westbrook	071	80115	None	None	None	90-day notice for periodic O&M dredging required.
		410	79167	None	None	None	None
		191	80309	None	None	None	No dredging 6-1-9/30. 90-day notice for periodic O&M dredging required.
		118	80132	None	Two: Area too large; Increase in boat traffic; area will become too commercial	Reduced area dredged; reduced volume from 400 cy to 150 cy	Need state license & COE approval of disposal site before dredging begins. 90-day notice for periodic O&M dredging required. No dredging 4/1-6/15.
		325	80064	None	None	None	90-day notice for periodic O&M dredging required.
		023	80286	None	None	None	90-day notice for periodic O&M dredging required.
		305	80233	None	None	None	Dredge during low flow periods. 90-day notice for periodic O&M dredging required.
		319	80227	None	None	None	90-day notice for periodic O&M dredging required.
		340	79177	None	None	None	90-day notice for periodic O&M dredging required.

TABLE 22 (Continued)

No.	Port/Town/City	ID No.	Permit No.	Significant Environmental and Social Impacts				Comments
				Short-Term		Long-Term		
				Adverse	Beneficial	Adverse	Beneficial	
		154	80174	-	-	-	-	Permit issued after the fact.
1.	Westbrook	071	80115	-	-	-	-	Disposal on permittee's land.
		410	79167	Water quality	-	-	-	-
		191	80309	Benthic species	-	-	Recreation	Permit issued after the fact. Disposal at town landfill.
		118	80132	Water quality Benthic species Air quality Noise	-	-	Navigation Recreation Safety	Permit issued as practical solution; original dredging 5 years earlier was not authorized.
		325	80064	Water quality	-	-	Navigation	Disposal at town landfill
		023	80286	Water quality Air quality Noise	-	Benthic species	Navigation Economics Safety	Significant benthic population disrupted; will eventually repopulate.
		305	80233	Water quality	-	-	Recreation Historic values	Disposal at town sanitary land fill dump.
		319	80277	Water quality	-	-	-	Disposal at town landfill
		340	79177	Water quality Benthic species Air quality Noise	-	-	Recreation Safety	Disposal at town landfill.

TABLE 23

SUMMARY OF SECTION 10 OPERATIONS AND MAINTENANCE (O & M) DREDGING PERMITS (500 cu yd - 1,500 cu yd)

No.	Port/Town/City	ID No.	Permit No.	State	Waterway Type	Dredging/Disposal					
						Method	Ft Below MLW	Area (sq ft)	Volume (cy)	Type of Material	Disposal Site
		266	79054	MA	Harbor	Clamshell	- 3	Unknown	500	Silt	Upland contain
		403	79280	RI	Harbor	Bucket	- 3	12,960	500	Sand, silt	Upland
		421	79135	ME	Lagoon	Bucket	- 8	Unknown	500	Clay,sand,gravel	Upland-contain
		190	80311	ME	Tidal River	Hydraulic	-35	62,000	800	Sand, silt	Upland-contain
		203	79319	MA	Harbor	Clamshell	- 8	12,000	850	Sand	Upland
		471	80039	MA	Bay	Bucket	Unknown	9,100	1,200	Sandy, granular	Upland
2.	Cos Cob	335	79104	CT	Tidal River	Bucket	- 6	9,048	1,300	Gravel,hardpan	Upland-contained
		418	79139	MA	Harbor	Bucket	-40	117,000	1,435	Silt	Upland
3.	Clinton	083	80104	CT	Harbor	Dragline	- 6	32,670	1,500	Silt	Upland

No.	Port/Town/City	ID No.	Permit No.	Objections		Mitigation	Special Conditions
				Agency	General Public		
		266	79054	Local Board of Health & Local Conservation Commission disposal site will contaminate water supply	Two: Contamination of water supply; odor; landscape pollution	Disposal site relocated	90 day notice for periodic O & M dredging required
		403	79280	None	One:will undermine deteriorated bulkhead	None	Permit not valid without State license
		421	79135	None	None	None	90-day notice for periodic O&M required
		190	80311	None	None	None	None
		203	79319	None	None	None	Permit not valid without State license. Dredge only during ebb tide in May. Use silt curtains
		471	80039	None	None	None	Permit not valid without State license. Dredge 6/1 - 6/15 only
2.	Cos Cob	335	79104	NFWS and NMFS: no dredging in intertidal marsh	None	Drop plan to dredge in wetlands	90-day notice for periodic O&M dredging required
		418	79139	None	None	None	90-day notice for periodic O&M dredging required
3.	Clinton	083	80104	None	One: runoff & odor	None	No dredging 6/1 - 9/30. Must prevent runoff from reentering waterway.

TABLE 23 (Continued)

No.	Port/Town/City	ID No.	Permit No.	Significant Environmental and Social Impacts: Short-Term: Adverse	Short-Term: Beneficial	Long-Term: Adverse	Long-Term: Beneficial	Comments
		266	79064	Water quality Benthic species Air quality Noise	-	-	Economics	All objections resolved by disposal on permittee's land.
		403	79280	-	-	-	-	Part of material used as backfill for existing bulkhead
		421	79135	Water quality Benthic species Air quality	-	-	Navigation safety	Disposal at city dump
		190	80311	Water quality	-	-	Navigation	Disposal on permittee's land
		203	79319	Water quality Finfish/plankton	-	-	Navigation Recreation	Disposal at town landfill
		471	80039	Water quality	-	-	Recreation	Disposal at private refuse site
2.	Cos Cob	335	79104	Water quality	-	-	-	Disposal on permittee's land
		418	79139	Water quality Benthic species Air quality Noise	-	-	Navigation Safety	-
3.	Clinton	083	80104	-	-	-	-	Disposal on parking lot

TABLE 24

SUMMARY OF SECTION 10 OPERATIONS AND MAINTENANCE (O & M) DREDGING PERMITS (2,100 cu yd - 12,000 cu yd)

No.	Port/Town/City	ID No.	Permit No.	State	Waterway Type	Dredging/Disposal					
						Method	Ft Below MLW	Area (sq ft)	Volume (cy)	Type of Material	Disposal Site
4.	Westbrook	004	79414	CT	Tidal river	Dragline	- 4	22,500	2,100	Bottom sediments	Upland
5.	Westbrook	494	79145	CT	Tidal river	Bucket	- 1	24,000	2,500	Silt	Upland-contained
		487	79152	MA	Tidal river	Share crane	- 6	4,800	2,500	Mud, clay	Upland
6.	Old Saybrook	206	79316	CT	Tidal river	Clamshell	- 6	Unknown	3,600	Silt	Upland-contained
		424	79140	MA	Harbor	Clamshell, dragline	- 6	Unknown	4,500	Silt, sand	Upland
7.	Essex	109	79376	CT	Cove	Clamshell, dragline	- 7	56,100	6,500	Silt,sand	Upland-contained
		200	80198	RI	Tidal river	Unknown	-36	11,400	7,000	Silt	Upland-contained
		301	80240	MA	River	Unknown	-30	82,500	12,000	Silt, clay	Upland-contained

No.	Port/Town/City	ID No.	Permit No.	Objections		Mitigation	Special Conditions
				Agency	General Public		
4.	Westbrook	004	79414	None	None	None	No dredging 6/1 - 9/31; must prevent runoff from entering waterway
5.	Westbrook	494	79145	NFWS, Conn.Dept.of Aquaculture, Local Planning Commission, Conservation Commission and Harbor Commission: Disposal in tidal wetlands	None	Disposal site relocated	Build containment dikes for disposal site; no dredging 6/1-9/30; use mats to protect adjacent wetland areas
		487	79152	None	None	None	Permit not valid without State license
6.	Old Saybrook	206	79316	None	None	None	90-day notice for periodic O&M dredging required; no dredging 4/1 - 9/30
		424	79140	None	None	None	Permit not valid without State license and COE approval of disposal site. 90-day notice for periodic O&M dredging required; stop work if historical artifacts uncovered
7.	Essex	109	79376	None	One: ocean dumping	Relocate disposal site upland	90-day notice for periodic O&M dredging required
		200	80198	None	None	None	None
		301	80240	None	None	None	None

TABLE 24 (Continued)

No.	Port/Town/City	ID No.	Permit No.	Significant Environmental and Social Impacts				Comments
				Short-Term		Long-Term		
				Adverse	Beneficial	Adverse	Beneficial	
4.	Westbrook	004	79414	Water quality	-	-	-	Disposal on permittee's parking lot
5.	Westbrook	494	79145	-	-	-	-	Disposal on permittee's driveway (diked area); all objections withdrawn after mitigation
		487	79152	Water quality	-	-	-	Disposal at town landfill
6.	Old Saybrook	206	79316	Water quality Benthic species Air quality Noise	-	-	Recreation	Disposal at town landfill
		424	79140	Water quality Benthic species Air quality Noise	-	-	Recreation Safety	-
7.	Essex	189	79376	Water quality Benthic species Air quality Noise	-	-	Recreation	Ocean dumping was originally planned
		200	80198	-	-	-	-	Disposal on permittee's property
		301	80240		-	-	Energy needs Safety	Disposal on permittee's property

Beach nourishment. As indicated in Table 25, those permits involving the disposal of dredged material on beaches for purposes of replenishment tend to have one factor in common: the dredged material consists largely of clean sand. As a group, these permits elicited only one public objection, which was not corroborated by the agencies co-ordinating with the Corps-NED on the issue in dispute. Furthermore, no significant long-term adverse environmental impacts are anticipated from these permit activites.

Upland disposal. Virtually all of the Section 10 and 404 permits comprising this category involve upland disposal sites which are contained, and from which the clean (filtered) effluent is returned to the waterway. Table 26 indicates that objections were raised only in the case of 3 permits with wetland disposal sites. Each of these 3 permits also resulted in anticipated significant long-term adverse impacts upon the wetland areas in question. Also, more numerous and stringent special conditions are attached to these permits, particularly with respect to the return of the effluent to the waterway.

Open water disposal. The most striking feature of the permit activities detailed in Tables 27 and 28 involve their geographic proximity to one another (with two exceptions involving Maine), as well as the fact that over two-thirds use the same disposal site: the Central Long Island Sound Regional Disposal Area (CLISRDA). Although virtually no agencies objected to the permit activities, the tables suggest that the larger the project, the more likely that objections from the general public will be raised. There are no anticipated significant long-term adverse environmental impacts associated with this category of permits, and the short-term adverse impacts appear to be less extensive than was the case with the other Section 10 and 404 maintenance dredging permits.

It should be noted, however, that the open water dumping of dredged material is subject to stringent controlled frequent monitoring, as evidenced by the number and detail of the special conditions attached to these permits. In three cases, the disposed material was capped by cleaner material available from a federal dredging project.

Section 10 and 103 Permits

Table 29 indicates that at least two factors differentiate this permit category from the previous one; namely, virtually all disposed material in this case is contaminated, and these permits represent geographic clusters of activities in Maine and Massachusetts, respectively. Furthermore, a substantially greater number of objections from the EPA, NFWS and NMFS were raised in conjunction with this set of permit activities. Also, more than half of the permits in Table 29 required that the disposed material be capped with cleaner sediments.

TABLE 25

SUMMARY OF SECTION 10 AND 404 OPERATIONS AND MAINTENANCE (O & M) DREDGING/DISPOSAL PERMITS INVOLVING BEACH REPLENISHMENT

No.	Port/Town/City	ID No.	Permit No.	State	Waterway Type	Dredging/Disposal					
						Method	Ft Below MLW	Area (sq ft)	Volume (cy)	Type of Material	Disposal Site
8.	Noank	391	79285	CT	Tidal river	Dragline	Unk.	Unk.	200	Sand	Beach Upland
9.	Milford	346	79100	CT	L.I. Sound	Bulldozer	0	40,800	2,455	Clean sand	Beach
		251	79247	MA	Tidal river	Unk.	-6	34,000	2,450	Sand	Beach Upland
10.	Milford	149	80167	CT	Harbor	Hydraulic	-9	Unk.	10,000	Sand	Beach
		380	79064	MA	Harbor	Hydraulic	-7	251,000	28,000	Sand, silt, gravel	Beach

No.	Port/Town/City	ID No.	Permit No.	Objections		Mitigation	Special Conditions
				Agency	General Public		
8.	Noank	391	79285	None	None	None	Permit not valid without state license. No dredging 6/1 - 9/10.
9.	Milford	346	79100	None	None	--	Dredge between 3/1 - 4/30 only. No sand to be removed below MLW line.
		251	79247		None	One: Loss of shellfish; possible violation of Mass. Wetlands Act.	90-day notice for periodic O & M dredging required. No dredging 6/1 - 9/15
10.	Milford	149	80167	None	None	None	No dredging after 6/15/80. Future work will require regular permit.
		380	79064	None	None	Increased area of beach replenished	90-day notice for periodic O & M dredging required.

No.	Port/Town/City	ID No.	Permit No.	Significant Environmental and Social Impacts				Comments
				Short-Term		Long-Term		
				Adverse	Beneficial	Adverse	Beneficial	
8.	Noank	391	79785	Water quality Air quality Noise	--	--	Recreation	Disposal on town beach and at town land fill.
9.	Milford	346	79100	Benthic species	--	--	--	--
		251	79247	Water quality	--	--	--	Disposal on beach and permittee's property.
10.	Milford	149	80167	--	--	--	Safety	Emergency permit.
		380	79064	Water quality	--	--	Navigation Recreation Safety	--

TABLE 26

SUMMARY OF SECTION 10 AND 404 OPERATIONS AND MAINTENANCE (O & M) DREDGING/DISPOSAL PERMITS: EFFLUENT FROM CONTAINMENT STRUCTURES RETURNED TO WATERWAY

No.	Port/Town/City	ID No.	Permit No.	State	Waterway Type	Dredging/Disposal					
						Method	Ft Below MLW	Area (sq ft)	Volume (cy)	Type of Material	Disposal Site
11.	Westport	483	79094	CT	Tidal river	Hydraulic	Unk	Unk	2,400	Sand, silt, mud	Upland-contained
		113	80125	MA	Tidal river	Bucket	-5	[illegible]48,000	3,000	Silty fine sand	Upland-contained
		358	79182	RI	Tidal river	Clamshell	-37	64,800	6,000	Organic silt	Upland-contained
		488	79153	MA	Bay	Clamshell, Hydraulic	-35	1,100,000	11,579	Silt & fine sand	Wetlands-contained
		475	79144	MA	Harbor	Bucket	-36	70,875	20,000	Sediment	Wetlands-contained
12.	Haddam	214	79333	CT	Tidal river	Hydraulic	-18	Unk	29,000	Sand	Upland-contained
		455	79045	MA	Harbor	Hydraulic	-3	150,000	40,000	Sand	Upland-contained
		423	79133	MA	Tidal river	Hydraulic, Bucket	-34	94,600	40,000	Sediment	Wetlands-contained
		051	79394	RI	Tidal river	Hydraulic, Bucket	-35	130,000	58,960	Grain, organic silt	Gravel berm & sheet pile containment area
		454	79044	NH	Harbor	Hydraulic	-6	958,320	75,000	Sand	Upland-contained. Fill behind jetty

No.	Port/Town/City	ID No.	Permit No.	Objections		Mitigation	Special Conditions
				Agency	General Public		
11.	Westport	483	79094	None	None	Redesign dikes to be higher. Use interior baffles in disposal area to retard flow.	Stop dredging if effluent through weir exceeds state water quality standards. No dredging 6/1-9/30.
		113	80125	None	None	None	Permit not valid without state license, 90-day notice for periodic O&M dredging required. Disposal site must not increase in area. Spoil must be adequately contained to prevent reentry
		358	79182	None	None	None	90-day notice for periodic O&M dredging required. Use hay bales to filter runoff
		488	79153	NFWS: Use of wetlands disposal site	None	None	Work subject to weekly govt inspection. Adequate siltation control will be used to control liquid runoff. Place hay bales at weir if necessary. 90-day notice for periodic O&M dredging required.
		475	79144	NFWS, EPA, NMFS: Use of wetlands disposal site. Loss of fish & wildlife	None	None	Same as permit # 79153, above.
12.	Haddam	214	79333	None	None	None	90-day notice for periodic O&M dredging required. No dredging 4/1-6/15.
		455	79045	None	None	None	None
		423	79133	EPA, NFWS, NMFS: Object to disposal site.	None	None	Permit not valid without state license.
		051	79394	None	None	None	None
		454	79044	None	None	None	90-day notice for periodic O&M dredging required. No dredging 4/15-11/1. Maintain safe distance from water & gas lines.

TABLE 26 (Continued)

No.	Port/Town/City	ID No.	Permit No.	Significant Environmental and Social Impacts				Comments
				Short-Term		Long-Term		
				Adverse	Beneficial	Adverse	Beneficial	
11.	Westport	483	79094	Water quality	-	-	-	-
		113	80125	Water quality Air quality Noise	-	-	Navigation Recreation	Disposal site is same one used by COE.
		358	79182	Water quality	-	-	-	-
		488	79153	Water quality	-	Wetlands	Economics Energy needs	Disposal site also used by COE for dredging of Federal channel.
		475	79182	Water quality	-	Wetlands	-	Disposal site also used by COE for dredging of Federal channel.
12.	Haddam	214	79333	Water quality Benthic species Air quality Noise	-	-	Economics Energy needs	Does not disrupt shad & salmon migration (4/1-6/1).
		455	79045	Water quality	-	-	Navigation	-
		423	79133	Water quality	-	Wetlands	Economics Energy needs	Disposal site also used by COE for dredging of Federal channel.
		051	79394	Water quality	-	-	-	-
		454	79044	Water quality	-	-	Navigation	-

TABLE 27

SUMMARY OF SECTION 10 AND 404 OPERATIONS AND MAINTENANCE (O & M) DREDGING/DISPOSAL PERMITS: OPEN WATER DISPOSAL (250 - 6,000 cu yd)

No.	Port/Town/City	ID No.	Permit No.	State	Waterway Type	Dredging/Disposal					
						Method	Ft Below MLW	Area (sq ft)	Volume (cy)	Type of Material	Disposal Site
13.	Darien	416	79253	CT	Tidal River	Bucket	-7	3,500	250	Sediment	CLISRDA
14.	Branford	072	80111	CT	LI Sound	Bucket	Unknown	Unknown	1,000	Black mud, sand	CLISRDA
15.	Darien	347	79082	CT	Tidal River	Bucket	-6	9,000	1,000	Sediments	CLISRDA
16.	Darien	476	79143	CT	Tidal River	Bucket	-8	8,750	1,150	Sediments	CLISRDA
17.	Darien	357	79185	CT	Tidal River	Bucket	-8	10,000	1,150	Sediments	CLISRDA
		373	79120	CT*	LI Sound	Bucket	Unknown	Unknown	1,680	Silty sand	CLISRDA
18.	Greenwich	507	79026	CT	Harbor	Bucket	-7	23,800	2,000	Silt, sand	CLISRDA
19.	Norwalk	141	80156	CT	Tidal River	Bucket	-6	2,500	2,200	Silt, mud	CLISRDA
		498	79122	ME	Bay	Bucket	-6	39,000	2,700	Silt, debris	Chebeague Is. Area
20.	East Norwalk	132	80123	CT	Harbor	Clamshell	-4	14,250	2,770	Mud	CLISRDA
21.	East Norwalk	143	80158	CT	Tidal River	Clamshell	-3	25,300	2,900	Sand, silty sand	CLISRDA
22.	Clinton	055	80120	CT	Harbor	Bucket	-5	14,400	3,000	Sand, gravel	Cornfield Point Dumping Ground
23.	East Norwalk	142	80157	CT	Harbor	Bucket	-6	97,500	3,000	Silt	CLISRDA
24.	Clinton	288	80254	CT	Harbor	Clamshell	-6	25,000	4,500	Silt	Cornfield Point Dumping Ground
25.	New Haven	277	79202	CT	Tidal River	Bucket	-17	32,000	4,500	Unknown	CLISRDA
26.	Clinton	274	80244	CT	Harbor	Bucket	-5	30,625	5,200	Silt	Cornfield Point Dumping Ground
27.	South Norwalk	146	80163	CT	Harbor	Clamshell	-6	44,000	6,000	Bottom mud	CLISRDA

*Dredging done in Oyster Bay under New York permit; disposal in Long Island Sound under NEP permit.

No.	Port/Town/City	ID No.	Permit No.	Objections		Mitigation	Special Conditions
				Agency	General Public		
13.	Darien	416	79253	Local River Commission: Dredging should not exceed 5 to 7 ft MLW	None	None	a, c, d, h
14.	Branford	072	80111	None	One: objected to open water disposal	None	a, b, c
15.	Darien	347	79082	None	None	Dredge to 6' instead of 8' below MLW	b
16.	Darien	476	79143	None	None	None	a,b,c
17.	Darien	357	79185	None	None	None	a,b,c
		373	79120	None	None	None	None
18.	Greenwich	507	79026	None	None	None	None
19.	Norwalk	141	80156	None	One: objected to open water disposal	None	a, b, c, e, f, g
		498	79122	None	None	None	c, e, i, j
20.	East Norwalk	132	80123	None	None	None	a, c, f, h
21.	East Norwalk	143	80158	None	None	None	a, b, c, e, f, g
22.	Clinton	055	80120	None	None	None	a, b, d
23.	East Norwalk	142	80157	None	None	None	a, b, c, d, e, g
24.	Clinton	288	80243	None	None	None	a, b, d
25.	New Haven	277	79202	None	None	None	a, b, h
26.	Clinton	274	80244	None	None	None	a, b, c
27.	South Norwalk	146	80163	None	None	None	a, c, e, f, g, h

Special Conditions:

a) Permittee required to dump at buoy set in disposal site and to hold each scow at complete halt at buoy before and after dumping of scow pockets.

b) No dredging 6/1 - 9/11.

c) Permit authorizes periodic maintenance dredging not to exceed 10 years from date of issue; permittee must notify COE 90 days in advance of intended date of work.

d) Dredging and dumping will be monitored by government personnel.

e) Activities must meet 1970 OSHA standards.

f) Cap disposed material by material from Federal project. Work must be completed before 12/1/80.

g) Scows enroute to/from CLISRDA must enter and leave harbor through Federal navigation channel.

h) Permit not valid unless state license is issued.

i) Must dump at buoy set for control purposes.

j) No work in water 4/15 - 11/30.

TABLE 27 (Continued)

No.	Port/Town/City	ID No.	Permit No.	Significant Environmental and Social Impacts				Comments
				Short-Term		Long-Term		
				Adverse	Beneficial	Adverse	Beneficial	
13.	Darien	416	79253	Water Quality	-	-	-	-
14.	Rranford	072	80111	Water Quality	-	-	-	-
15.	Darien	347	79082	Water Quality	-	-	-	-
16.	Darien	476	79143	Water Quality	-	-	-	-
17.	Darien	357	79185	Water Quality	-	-	-	-
		373	79120	Water Quality	-	-	-	-
18.	Greenwich	507	79026	Water Quality Benthic Species	-	-	Navigation Recreation	-
19.	Norwalk	141	80156	-	-	-	-	-
		498	79122	Water Quality Benthic Species Air Quality Noise	-	-	Navigation Recreation	-
20.	East Norwalk	132	80123	-	-	-	-	-
21.	East Norwalk	143	80158	-	-	-	-	-
22.	Clinton	055	80120	-	-	-	-	-
23.	East Norwalk	142	80157	-	-	-	-	-
24.	Clinton	288	80243	-	-	-	-	-
25.	New Haven	277	79202	Water Quality	-	-	-	-
26.	Clinton	274	80244	-	-	-	-	-
27.	South Norwalk	146	80163	-	-	-	-	-

TABLE 28

SUMMARY OF SECTION 10 AND 404 OPERATIONS AND MAINTENANCE (O & M) DREDGING/DISPOSAL PERMITS: OPEN WATER DISPOSAL (9,500 - 49,000 cu yd)

No.	Port/Town/City	ID No.	Permit No.	State	Waterway Type	Dredging/Disposal					
						Method	Ft Below MLW	Area (sq ft)	Volume (cy)	Type of Material	Disposal Site
28.	Rowayton	224	80261	CT	Cove	Bucket	-6	148,000	9,500	Sandy silt	CLISRDA
29.	South Norwalk	194	80329	CT	Tidal River	Bucket	-8	66,000	9,600	Sand, silt	CLISRDA
30.	Milford	318	80225	CT	Harbor	Unknown	-8	84,375	10,000	Silt	CLISRDA
31.	East Norwalk	056	80307	CT	Tidal River	Bucket	-8	140,000	12,500	Sand, organic matter	CLISRDA
32.	New London	404	79278	CT	Tidal River	Bucket	-25	55,000	21,675	Sediment	New London Disposal Site
		462	80028	ME	Harbor	Bucket	Unknown	165,000	24,000	Sand, gravel	COE-approved ocean site
33.	Milford	360	80226	CT	Harbor	Unknown	-8	193,200	35,000	Silt	CLISRDA
34.	New Haven	181	80346	CT	Harbor	Clamshell	-35	282,500	35,000	Class I	CLISRDA
35.	Groton	376	80071	CT	Tidal River	Hydraulic	-40	290,000	40,000	Silt, mud, clay, sandy gravel	New London Disposal Site
36.	Clinton	443	79269	CT	Harbor	Bucket	-7	1,098,800	49,000	Sand, silt	Cornfield Point Dumping Ground

No.	Port/Town/City	ID No.	Permit No.	Objections		Mitigation	Special Conditions
				Agency	General Public		
28.	Rowayton	224	80261	None	Four: Object to open water disposal; east boundary of area is unclear	East limit of channel was redefined	a, b, c, e, (markers to be placed at east boundary)
29.	South Norwalk	194	80329	None	One: 10-year authorization too long.	None	a, b, c, e
30.	Milford	318	80225	None	One: objected to open water disposal	None	a, b, c
31.	East Norwalk	056	80307	None	One: adverse aesthetic and environmental impacts	None	a, b, c
32.	New London	404	79278	None	None	None	c, e, f, g
		462	80028	None	None	None	a, e
33.	Milford	360	80226	None	None	None	b, d
34.	New Haven	181	80346	None	None	None	a, b, c, d, e
35.	Groton	376	80071	None	One: Objected to open water disposal	None	a, b, c
36.	Clinton	443	79269	None	None	None	a, c, d

Special Conditions:

a) Permittee required to dump at buoy set in disposal site and to hold each scow at complete halt at buoy before and after dumping of scow pockets.

b) No dredging 6/1 - 9/31.

c) Permit authorizes periodic maintenance dredging not to exceed 10 years from date of issue; permittee must notify COE 90 days in advance of intended date of work.

d) Dredging and dumping will be monitored by government personnel.

e) Activities must meet 1970 OSHA standards.

f) Work must be completed prior to Navy dredging.

g) Stop work if archeological, scientific, pre-historical, or historical artifacts are found.

TABLE 28 (Continued)

No.	Port/Town/City	ID No.	Permit No.	Significant Environmental and Social Impacts				Comments
				Short-Term		Long-Term		
				Adverse	Beneficial	Adverse	Beneficial	
28.	Rowayton	224	80261	-	-	-	-	-
29.	South Norwalk	194	80329	Water Quality Benthic Species	-	-	Navigation	-
30.	Milford	318	80225	-	-	-	-	-
31.	East Norwalk	056	80307	Water Quality Benthic Species	-	-	Navigation Recreation	-
32.	New London	404	79278	Water Quality Finfish/Plankton	-	-	-	-
		462	80028	Water Quality	-	-	Economics, Saftey	-
33.	Milford	360	80226	-	-	-	-	-
34.	New Haven	181	80346	Water Quality	-	-	Energy needs	-
35.	Groton	376	80071	-	-	-	-	-
36.	Clinton	443	79269	Water Quality Benthic Species	-	-	-	-

TABLE 29

SUMMARY OF SECTION 10 AND 103 OPERATIONS AND MAINTENANCE (O & M) DREDGING/DISPOSAL PERMITS *

ID No.	Permit No.	State	Waterway Type	Dredging/Disposal					
				Method	Ft Below MLW	Area (sq ft)	Volume (cy)	Type of Material	Disposal Site
150	80164	ME	Harbor	Clamshell	-34	40,000	2,200	Contaminated mud	Ocean dump site
145	80162	ME	Harbor	Bucket	-10	30,250	3,900	Contaminated silt, mud	Ocean dump site
186	80317	MA	Tidal river	Clamshell	-35	48,000	7,000	Contaminated silt	Ocean dump site
180	80345	MA	Harbor	Bucket	-6	25,000	9,000	Spoils	Ocean dump site
269	80014	ME	Harbor	Bucket	-34	41,250	12,000	Contaminated organic silt	Ocean dump site
463	80026	ME	Harbor	Bucket	Unk	1,440,000	12,000	Contaminated clay, silt, sand	Ocean dump site
234	80007	ME	Harbor	Bucket	Unk	Unk	12,000	Contaminated silt	Ocean dump site
439	80013	ME	Harbor	Bucket	-35	132,000	20,000	Contaminated silt	Ocean dump site
073	80116	MA	River	Clamshell	-35	19,500	25,600	Contaminated silt, sand	Ocean dump site
151	80169	ME	Harbor	Bucket	-14	100,000	50,000	Contaminated sediments	Ocean dump site
282	79418	MA	Cove	Bucket	-9	Unk	50,000	Contamined sediments	Ocean dump site
500	79119	MA	Harbor	Bucket	-37	Unk	67,000	Contaminated silt	Ocean dump site

*This table contains no permits issued for dredging in Connecticut.

ID No.	Permit No.	Objections		Mitigation	Special Conditions
		Agency	General Public		
150	80164	None	None	None	a, b, c, d, e, f
145	80162	None	None	None	a, b, c, d, e, f
196	80317	EPA,NFWS,NMFS: Bioassay test results inconclusive	None	None	a, b, c, d, g
180	80345	NFWS: Area to be dredged is contaminated	None	None	a, b, c, d, g
269	80014	None	None	None	a, b, i
463	80026	None	None	None	a, b, d, e, h
234	80007	None	None	None	h
439	80013	None	None	None	h
073	80116	NMFS: Potential adverse impacts of high vanadium concentration	None	None	a, b, d, e
151	80169	None	None	None	a, b, c, d, e, f
282	79418	NFWS: Bioassay tests needed	None	Relocate disposal area from MA Bay to Marblehead Light	a, b, c, g
500	79119	NFWS & NMFS: Violates new guidelines	None	None	a, b, c, d, g

Special Conditions:

a) Permit authorizes periodic maintenance dredging not to exceed 10 years from date of issue; permittee must notify COE 90 days in advance of intended date of work.

b) Permittee required to dump at buoy set in disposal site and to hold each scow at complete halt before and after dumping of scow pockets.

c) Dredging and dumping will be monitored by government personnel.

d) Activities must meet 1980 OSHA standards.

e) Tow boats follow same route to and from disposal site, as directed by government inspector.

f) Cover disposed material by material from Federal maintenance dredging in Fore River. Work must be completed before 8/1/80.

g) Notify Coast Guard 48 hours prior to departure of disposal ship.

h) Dredge spoil must be capped with material from Federal dredge project.

i) Dredge spoil must be capped with material from Federal dredge project; work must be completed by 4/1/80.

TABLE 29 (Continued)

ID No.	Permit No.	Significant Environmental and Social Impacts				Comments
		Short-Term		Long-Term		
		Adverse	Beneficial	Adverse	Beneficial	
190	80164	-	-	-	-	Portland disposal area
145	80162	-	-	-	-	Portland disposal area
196	80317	Water quality			Navigation Economics Energy needs Safety	Marblehead Light disposal area
188	80345	Water quality Finfish/plankton Benthic species Air quality Noise	-	-	Navigation Economics Safety	Marblehead Light disposal area
289	80014	-	-	-	-	COE disposal site at sea
463	80026	-	-	-	-	COE disposal site at sea
234	80007	-	-	-	-	COE disposal site at sea
419	80013	-	-	-	-	COE disposal site at sea
073	80116	Water quality Air quality Noise	-	-	Energy needs	Marblehead Light disposal area
151	80169	-	-	-	-	Portland disposal area
282	79418	Water quality Benthic species Air quality Noise	-	-	Navigation Recreation Safety	Marblehead Light disposal area
500	79119	Water quality Air quality Noise	-	-	Economics	Marblehead Light disposal area

As was the case previously, no significant long-term adverse environmental impacts were anticipated, and the number and stringency of special conditions attached to these permits is slightly greater in this case than in the previous one.

No evaluations of environmental impacts were included in the permit file for the Portland Harbor (ME) activities. Essentially, these impacts were adequately evaluated in an EIS prepared for federal projects carried out in an adjacent area.

4.3.2 Improvement Dredging Permits

To the extent that material dredged as part of improvement dredging programs tends to be cleaner than that produced from maintenance dredging, it would appear that the disposal aspects of improvement dredging activities would constitute less of a potential hazard to the environment. On the other hand, the dredging of new basins and channels introduces the possibility of adverse environmental impacts related to the dredging itself which would not be as likely to be encountered in the case of maintenance dredging. In this section, two categories of improvement dredging/disposal permits are discussed.

Section 10 (only) Permits

Table 30 indicates that the scope of the improvement dredging/disposal permits issued pursuant to Section 10 only is relatively limited--i.e., ranging from 10 to roughly 5,000 cubic yards of material dredged. As a group, these permits were characterized by quite a few objections being raised, all of which were resolved through mitigation. With a few exceptions, short-term adverse environment impacts are expected to be within the range commonly associated with dredging/disposal activities. There are virtually no long-term adverse impacts projected to result from these activities.

Section 10 and 404 Permits

Table 31 illustrates the key attributes of Section 10 and 404 permits issued for improvement dredging purposes. With only one exception, they all involve open water disposal. In terms of volume of material dredged, there would appear to be no common denominator linking these permits. However, there were virtually no ojections raised, and the number and type of special conditions imposed (again, with one exception) are considerably less than similar maintenance dredging permits. It is evident from Table 31 that the material dredged is relatively clean in all but one case. No significant long-term adverse impacts are anticipated.

TABLE 30

SUMMARY OF SECTION 10 IMPROVEMENT DREDGING/DISPOSAL PERMITS

No.	Port/Town/City	ID No.	Permit No.	State	Waterway Type	Dredging/Disposal					
						Method	Ft Below MLW	Area (sq ft)	Volume (cy)	Type of Material	Disposal Site
		200	79423	MA	River	Unk.	- 1	120	10	Unk.	Backfill for bulkhead.
		156	80182	RI	Tidal pond	Bucket	- 2	Unk.	20	Silty bottom	
		167	80213	ME	Slough	Unk.	Unk.	700	75	Unk.	Upland
		407	80054	RI	Cove	Bucket	- 6	3,102	600	Sandy silt	Upland
		509	79022	NH	Tidal river	Hydraulic	- 4	Unk.	1,250	Granular, mud	Upland--contained.
		504	79161	MA	Tidal river	Bucket	- 4	40,150	1,300	Sand	Upland
37.	Chester	417	49250	CT	Tidal pond	Bucket	- 6	32,500	2,200	Sand, silt	Upland
		467	79086	MA	Bay	Dragline	- 4	15,200	3,700	Sand	Upland
		281	79421	RI	Cove	Unk.	-11	31,500	5,400	Silt, clay	Upland

No.	Port/Town/City	ID No.	Permit No.	Objections		Mitigation	Special Conditions
				Agency	General Public		
		200	79423	None	None	None	None
		156	80182	None	None	None	None
		167	80213	None	None	None	Permit not valid without state license.
		407	80054	Local Historical Comm: Disposal site may have archeological artifacts.	One: Spoil disposal may be hazardous to adjacent owners.	Relocate disposal site to town dump.	Permit not valid without state license.
		509	79022	None	None	None	90-day notice for periodic O & M dredging required. No dredging 4/16 - 11/1. Remove unauthorized piles, float and fill.
		504	79161	None	None	None	None
37.	Chester	417	49250	None	One: runoff will encroach upon neighbor's land.	Excluded wetland from disposal site. Grade spoils area away from abutting property owner.	Permit not valid without state license. 90-day notice for periodic O & M dredging required. No work 6/1 - 9/1.
		467	79086	None	Three: claims permittee had no authority to file application; was a waste of energy; questioned who would finance work.	Deleted request for asphalt road.	90 day notice for periodic O & M dredging required. Remove all shellfish before dredging.

TABLE 30 (Continued)

No.	Port/Town/City	ID No.	Permit No.	Significant Environmental and Social Impacts				Comments
				Short-Term		Long-Term		
				Adverse	Beneficial	Adverse	Beneficial	
		280	79423	--	--	--	--	--
		156	80182	Water quality Benthic species	--	--	Recreation	--
		167	80213	--	--	--	--	--
		407	80054	Water quality	--	--	--	Mitigation satisfied objectors.
		509	79022	Water quality Finfish/Plankton Air quality Noise	--	--	Recreation	--
		504	79161	Water quality Air quality Noise	--	--	Navigation	--
37.	Chester	417	79250	Water quality Air quality Noise	--	--	Navigation	Applied for Section 10 and 404 permit. After mitigation issued Section 10 permit.
		467	79006	Water quality	--	--	Navigation Recreation Safety	--
		281	79421	Water quality	--	--	-	Permittee is U.S. Coast Guard.

TABLE 31

SUMMARY OF SECTION 10 AND 404 IMPROVEMENT DREDGING/DISPOSAL PERMITS

No.	Port/Town/City	ID No.	Permit No.	State	Waterway Type	Dredging/Disposal					
						Method	Ft Below MLW	Area (sq ft)	Volume (cy)	Type of Material	Disposal Site
38.	Groton	171	80201	CT	Tidal	Bucket	-7	24,200	1,200	Sand	New London disposal site
39.	Groton	173	80200	CT	Tidal river	Bucket	-7	46,000	5,500	Sand	New London disposal site
40.	West Haven	054	80119	CT	L.I. Sound	Bulldozer	-0	96,000	16,000	Clean sand	Town public beach
41.	Groton	210	79312	CT	Tidal river	Bucket	-39	Unk.	36,000	Bottom sediment	New London disposal site
		235	80006	MA	Canal	Bucket	Unk.	Unk.	150,000	Sand, large rocks	COE ocean disposal site
42.	Groton	215	79332	CT	Tidal river	Bucket	-40	2,227,500	1,800,000	Organic silt	New London disposal area

No.	Port/Town/City	ID No.	Permit No.	Objections		Mitigation	Special Conditions
				Agency	General Public		
38.	Groton	171	80201	None	None	None	90-day notice for periodic O & M dredging required. No dredging 6/14 - 9/30.
39.	Groton	173	80200	None	None	None	Same as #80201
40.	West Haven	054	80119	None	None	None	No dredging 6/1 - 9/30
41.	Groton	210	79312	None	None	None	90-day notice for periodic O & M dredging required. Dump at buoy set for control purposes. Work will be monitored by government personnel. Must meet 1970 OSHA standards. Permit not valid without state license.
		235	80006	None	None	Applicant agreed to use material for beach replenishment when doing O & M dredging.	None
42.	Groton	215	79332	None	None	None	Dump at buoy set for control purposes. Work will be monitored by government personnel. Must meet 1970 OSHA standards.

No.	Port/Town/City	ID No.	Permit No.	Significant Environmental and Social Impacts				Comments
				Short-Term		Long-Term		
				Adverse	Beneficial	Adverse	Beneficial	
38.	Groton	171	80201	Water quality Benthic species Air quality Noise	--	--	Recreation	--
39.	Groton	173	80200	Water quality Benthic species Air quality Noise	--	--	Recreation	
40.	West Haven	054	80119	--	--	--	--	Beach replenishment
41.	Groton	210	79312	Water quality Finfish/Plankton	--	--	--	--
		235	80006		--	--	--	--
42.	Groton	215	79332	--	--	--	--	Two public hearings held. EIS issued by permittee (U.S. Navy). Favorable response.

Summary

Considered collectively, permits issued in 1979 and 1980 (New England) regulating operations and maintenance as well as improvement dredging pursuant to Sections 10 (only), Sections 10 and 404 and Sections 10 and 103 did not result in significant long-term adverse impacts upon the environment. Furthermore, there was little or no evidence in the permit files to indicate that long-term adverse cumulative impacts were being experienced, with the possible exception of the open water disposal activities. To a large extent, this can be attributed to the stringent monitoring of the disposal of dredged material, as well as to the attachment of special conditions to minimize the potential adverse effects of the permit activities. This is particularly evident in the case of the Section 10 and 103 permits.

On the other hand, significant long-term beneficial social and environmental impacts of these activities are anticipated in many cases, outweighing whatever short-term adverse impacts might result.

In a sense, there is good potential for the use of general permits to regulate these activities, even if not in an immediate sense. For, in order for a general permit program as it applies to dredging/disposal activities to be successfully applied, a good deal of preliminary evaluation is called for, including the advanced identification of sites for disposal of dredged material.

The following suggestions for general permit guidelines for dredging/disposal activities are necessarily limited, although many do reflect perhaps the maximum extent to which one can generalize from previous permits:

- Section 10 only
  - Applicability: improvement and maintenance dredging.
  - Maximum volume of material dredged/disposed: 10,000 cubic yards.
  - Areas excluded from dredging: wetlands.
  - Disposal site: appropriate to sediment class, volume of material and geographic area. Wetlands are excluded.
  - Method: appropriate to conditions.
  - Special conditions: appropriate to area, disposal site and time of year.
- Section 10 and 404 - excluding beach nourishment
  - Applicability: improvement and maintenance dredging.
  - Maximum volume of material dredged/disposed: 50,000 cubic yards.
  - Areas excluded from dredging: wetlands.

- Disposal site: appropriate to sediment class, volume of material and geographic area. Wetlands are excluded.
- Method: appropriate to conditions.
- Special conditions: appropriate to area, disposal site and time of year.

o Section 10 and 404 - beach nourishment

- Applicability: improvement and maintenance dredging.
- Maximum volume of material dredged/disposed: 10,000 cubic yards.
- Areas excluded from dredging: wetlands.
- Disposal site: limited to beaches, excluding wetlands.
- Material dredged: Class I, appropriate to area.
- Method: appropriate to conditions.
- Special conditions: appropriate to area, disposal site and time of year.

o Section 10 and 103

- Not eligible for general permits.

Given these guidelines, it is possible to estimate the number of individual permits issued in 1979 and 1980 by the Corps-NED which might have been handled by general permits if: a) the guidelines had been in effect; and b) area evaluations and the prior selection of disposal sites were as well-advanced as envisioned here (i.e., if a general permit had been issued for a special activity and/or geographic area) as follows:

Type of Permit	# of Permits	# of Eligible Permits
Section 10 only	36	35
Section 10 and 404 (excluding beach nourishment)	43	34
Section 10 and 404 (beach nourishment)	5	5
Section 10 and 103	12	0
	96	74

The 74 "eligible" permits represent 9.7 percent of all permits issued in 1979 and 1980 by the Corps-NED, and they are 77 percent of all single-activity dredging permits.

APPENDIX E

Workshops Summary

WORKSHOP SUMMARY

1.0 INTRODUCTION

During May, Corps planners held a series of four Public Workshops in the Long Island Sound (LIS) area. The purpose of the workshops was to inform individuals of the LIS Containment Study, to introduce the concept of dredged material containment and to elicit feedback on concerns and suggestions regarding dredged material containment. Locations and dates of the Public Workshops were as follows:

- New London, CT., May 18, 1981
- New Haven, CT., May 19, 1981
- Stamford, CT., May 20, 1981
- Great Neck, N.Y., May 21, 1981

The Workshops were fairly well attended by a variety of individuals representing themselves or a particular interest group or governmental entity. The structure of the workshops consisted of introductory comments on the dredging and dredged material disposal situation in L.I.S., the Corps' LIS Containment Study objectives and conduct, and review of the dredged material containment concept using slides of existing containment facilities.

Comments from and communication with workshop attendees was encouraged in an informal discussion period. Names, addresses and comments were solicited through use of questionnaire cards.

Summarization of the workshops is based on review of the written comment cards obtained at the workshops. A total of 166 cards were turned in with completed addresses. Of these, 81 persons responded with comments on questions in the available space. Section 2.0 of this summary provides a breakdown of 166 attendees affiliations. Section 3.0 presents a summary of concerns articulated by those 81 persons responding with comments.

2.0 PROFILE OF ATTENDEE AFFILIATIONS

A total of nine categories of attendee affiliations are identified and summarized as follows:

Affiliation	Number
Federal Government	6
State Government	13
Regional Planner	1
Local Government	20
Marine Trades	31
Consulting	12
Environmental Organization	13
Academic	5
News Media	2
Individual Citizens	63
TOTAL	166

The category for individual citizens includes persons who indicated no organizational affiliation.

3.0 ATTENDEE CONCERNS AND QUESTIONS

Concerns and questions obtained from the attendees were also divided into categories and subcategories as follows:

Environmental Impacts

- Biological
- Toxic substances (metals, PCB's)

Containment Site Details

- Design of containment facilities
- Costs
- Monitoring
- Location of containment sites

Planning Process

- Value of workshops
- Interest in future activities

Table A-1 summarizes the frequency of responses regarding each category of concern by attendee category. Selected detailed comments by individuals for each category are presented below.

TABLE A-1 WORKSHOPS SUMMARY

Attendee Categories	No.	COMMENTS							
		Environmental Concerns		Containment Site Details				Planning Process	
		Biological	Toxics	Design	Costs	Moni-toring	Location	Workshop Interest	Future Interest
Federal govt.	6		1						2
State govt.	13	1	1	1				4	4
Regional govt.	1						1		
Local govt.	20		1	1	1		1	5	5
Marine trades	31	1	2	2	1		5	6	10
Consulting	12				1			2	4
Environmental orgnaizations	13		1	1		1	2	5	2
Academic	5		1						2
News media	1							2	
Individuals	163	1	3	2	2		8	9	11
TOTAL	166	3	10	7	5	1	17	33	40

3.1 ENVIRONMENTAL CONCERNS/QUESTIONS

A total of 13 responses were categorized as environmental concerns and these focused primarily on toxic substances. Select comments include the following:

- Will containment really prevent contaminant mobility?
- Are there any studies of heavy metal migration across clay liners?
- How does a created marsh contain toxic substances given tidal circulation?
- Is there such a thing as an "impervious" dike?
- Dike failure could cause massive release of toxic matter.
- Can we keep toxics out of sediments to begin with?
- What is the source of PCB's in LIS?
- Containment is desirable solution to avoid dumping of toxics in open water.
- What about absorption of metals into plants and animals in substrate?

3.2 CONTAINMENT SITE DETAILS/QUESTIONS

A total of 31 responses were categorized as relating to details of containment facility design, costs, monitoring and location. Most of these comments related to site location. Select comments include the following:

Design:

- o Rip-rap required for erosion protection.
- o Containment facility could protect existing shore from erosion but must not fail itself.
- o Does dewatering process remove 100% of water from containment area?
- o Ability of containment areas to withstand erosion is critical.
- o How high are dike walls for a marsh project?

Costs:

- o Containment would at least double cost due to double handling of the material.
- o Private sector involvement requires minimum costs.
- o Comparative costs of containment versus dumping?
- o Who pays for containment?
- o Who funds repairs to facility?

Location:

- o Have you considered rock chain along East Haven shore?
- o What are proposed sites for islands, marshes?
- o Two sites in New Haven area could be Morris Cove and north side of Sandy Point is West Haven.
- o Open any dump sites opposite towns that have good water quality (i.e., sediments not contaminated).
- o Locating sites will be tricky but there must be plenty of places where the goal can be restoration.
- o There is critical need for sites in NYS waters of western LIS.
- o Suggest containment site in Westport next to Saugatuck River.
- o Sites? Where?

3.3. PLANNING PROCESS

Most written comments related to two aspects of the planning process, including (1) a general endorsement of the workshops as an educational medium and (2) expressions of interest in being kept informed of future planning activities. Select comments follow:

Workshop Interest:

- o Excellent presentation
- o Good idea to come to the public before proposals on projects and getting opinions.
- o Very interested in cooperating with investigations.
- o Good workshop.
- o Containment seems a good answer.
- o Thanks for the opportunity to question and comment.
- o Appreciated being invited.
- o Very positive discussion and gives hope for successful management of difficult problem.

Future Interest:

- o Please put me on mailing lists.
- o Make sure I'm on any and all mailing lists.
- o Keep us informed of future workshops and proposed projects.
- o Looking for future information on this topic.
- o Next newsletter could include criteria to guide locals as to what is a good site.
- o Please forward copies of background reports.
- o Please send me criteria for siting and any up-to-date maps showing tentative sites.
- o Would like to obtain information on potential containment sites as it is developed.